POPULAR AVIATION

64
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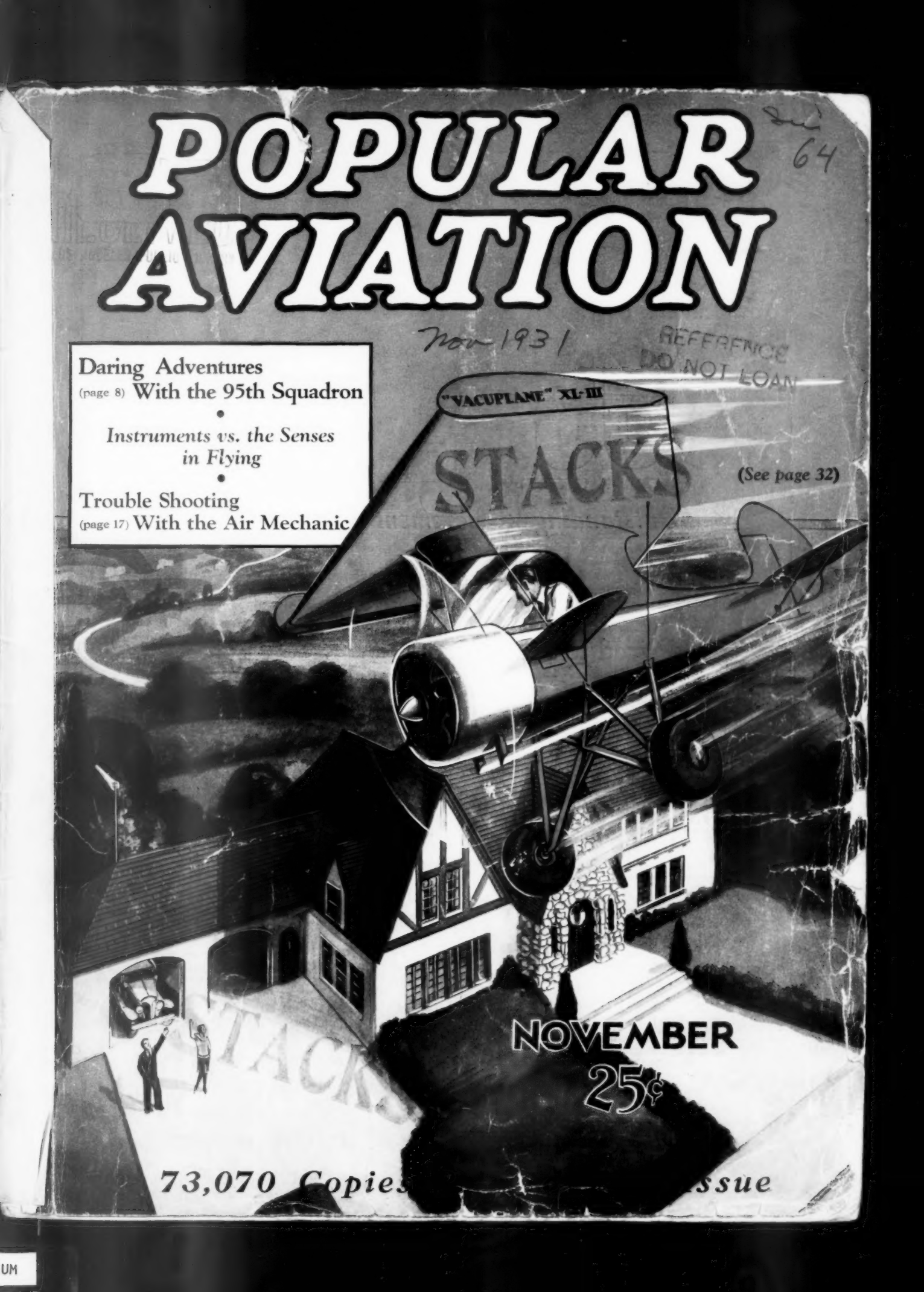
Daring Adventures
(page 8) With the 95th Squadron

Instruments vs. the Senses in Flying

Trouble Shooting
(page 17) With the Air Mechanic



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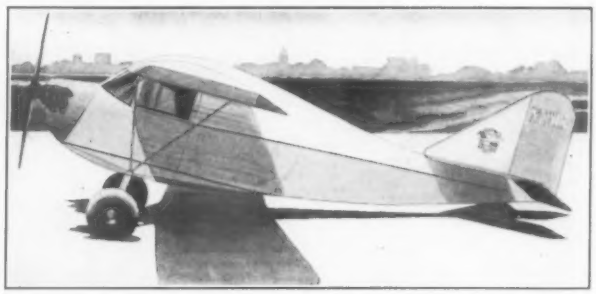

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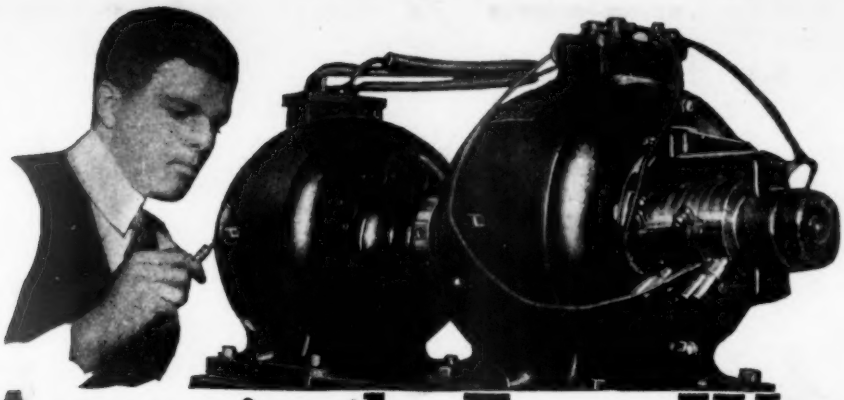

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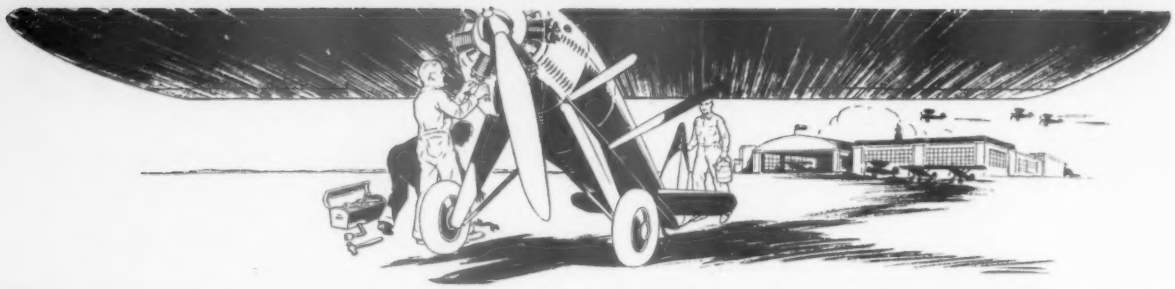

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Dallas, Tex., Student Tells Why He Selected the Lincoln School

Read Mr. Ezell's Letter to Young Men Interested In Aviation

"My home is in Dallas, Texas. After personally inspecting the schools in my home city, I wrote for information about a number of the most widely advertised schools. It was my desire as well as the wish of my parents that I should take the best training possible to get. We decided on the Lincoln Airplane and Flying School.

Examines Mechanics' School and Airport

"On arriving at the Lincoln School, I had a personal visit with the president, Mr. E. J. Sias, who outlined to me very carefully the curriculum of training which this school follows. He then showed me through the well equipped shops and classrooms where the ground and mechanics' school is conducted. I had never seen anything to compare with this well ordered and complete ground and mechanical division. It impressed me as a great mechanical school and factory combined. Facilities were complete with airplanes and airplane motors of various types. One could readily see that Lincoln students are prepared by the most modern and practical means to become real airplane and engine mechanics.

"I was then taken to the airport. Here I found high and low winged monoplanes and biplanes, open cockpit planes and cabin planes, medium sized as well as the large transport types; new and well serviced with modern radial type motors. All used for training students and all approved by the Department of Commerce for use in a Government Approved School.

"I also learned that all the flight instructors were not only seasoned transport pilots but pilots who carry instructors' licenses qualifying them as flight instructors in a Government Approved School. After seeing the splendid facilities which this school has for training, I could readily understand why this school enjoys its reputation as the 'best known aviation school in the world.' I felt fortunate indeed that I had selected this Lincoln School.

Well Pleased

"To say that I am well pleased with my training is putting it mildly. From the smallest detail in the ground and mechanics' school to the most difficult maneuvers in my flight training, every step of my training has been thorough and complete. No detail has been overlooked. The positions secured by graduates during my training at the school proves that there are openings in aviation for Lincoln graduates.

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Raymond Ezell, Dallas, Texas

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An Airy Chat With the Editor

DURING these fall days, we have a lot of time to think over the various happenings of the past season. This has been an important and eventful year in aviation. Records have been broken by the score, new types have been developed and altogether the life of the Editor has been just one jump after another to keep up with the events.

There's one strange thing about it, though—the fact that in spite of the hustle and bustle of the past season, about 90 per cent of our readers' thoughts go lovingly back to the wartimes with a constant call for pictures and stories of wartime ships and action.

* * *

WE were looking over a heap of correspondence the other day, wondering just where to start in when our eye caught the comments of Norval Clarkson, Macon, Mo. Now, Norval is like us in at least one respect. He feels rather huffy about the outcome of the Schneider Cup race and is starting out to see what he can do about it.

I have just read in the papers that the British Super-Marine S6B did 386 M.P.H., and just a couple of days before that the American plane, I think the Gee Bee Sportster, went something over 200 M.P.H.

Now I should like, if it is not asking too much of you, to have you get some first-hand information on the Super-Marine S6B powered with a Rolls-Royce motor. Send it to me (if possible, publish it in your keen magazine so the rest of the fans can read about it, too).

And, also, I should like some capable writer tell me why the race planes of America cannot do as well as the English planes. It has always been a puzzle to me, and always shall be, until someone gives me the explanation.

It seems to me that if no other way that we could build the planes and power them with foreign motors. I know that the Thompson trophy is a race for landplanes and that the Schneider trophy is for seaplanes, but all the same the United States Navy has some seaplanes, and in 1923 and 1925 America won the Schneider trophy but something went haywire and we dropped out.

P. S. I am not knocking America in any way. However, I may sound like it. I merely want to know what is the matter with America and the speed planes.

Now, Norval, we will let you into a deep secret. When you load a special 1,900-horsepower engine on a pair of 30-foot wings, as with the British Super-Marine, a whole lot more is likely to happen than with a ship equipped with a smaller stock motor. When we get down to brass tacks, our patriotic tendencies rejoice more at the "P. S." than at the third paragraph. This country can build a winning ship, and win with it, too, as we proved both in 1923 and 1925.

* * *

DIGGING down a little deeper into the pile, we run across a whole bunch of letters praising the wartime stories of Lieut. Richardson. They are good—we'll not deny it—but you should read his article in this issue if you are looking for real action. This time we have the day-by-day history of the 95th Squadron—a combat unit—and, unlike most war stories that we read, this one is true to the last dot.

Announcement

WE TAKE pleasure in announcing that John B. Rathbun has been appointed Managing Editor of POPULAR AVIATION. *Mr. Rathbun has been a contributor to this magazine for a long time and his work is well known to all* POPULAR AVIATION *readers.*

Being an engineer, Mr. Rathbun became intensely interested in aviation at a very early date. He remembers Octave Chanute and Herring personally when they conducted their first gliding experiments at the sand dunes in northern Indiana.

He is an able pusher-type pilot (F.A.I.-43) dating back from the time when the pilot sat out on the front porch of the ship. From this time on he has been connected with various aeronautical activities largely in the role of designing engineer.

And just one moment please. In our next issue we are hoping to give you a temporary change in the wartime bill-of-fare. This will be a wartime air story written from the German point of view. Look for it in the next issue for it's well worth reading.

* * *

OL' CAP PURCELL writes with a punch. We hardly need tell you that. And added to his high pressure method of expression, and his original viewpoint on every subject from antelopes to zebras, he knows what he is taking about from first-hand experience. Formerly, our good skipper got the gals all upset when he shot the air full of anti-suffrage comments. And you should have heard the ladies roar back at him—di mi.

Now that their better instincts are coming into control, we are getting quite friendly letters from the Daughters of the Revolution, and some of them are actually admiring our dear captain. This rather goes to prove that the cave-man stuff wins out in the long run, and to show that this idea is correct, we will publish just one of these letters from a girl, woman or lady who signs herself Bessie D. Maybe "D" stands for detective.

The reason for this letter is Captain Purcell's article. I have always felt that this man was an Old Bear, but after reading this article I have decided that he must have a heart after all. In fact, I am sure of this after showing the story to my instructor.

He gave me some real information about the Captain that I am going to pass on. My instructor was one of Captain Purcell's boys at North Island, and he threatened to kill me if I ever told where the information came from.

In the Army one name followed Captain Purcell like his shadow, and that name was "Dynamite." Another story is going around that our Captain went through a court martial for beating up an English Colonel, for the Colonel called him a dirty Irishman. The Captain was saved by a very prominent General—or something.

I live in the same district that the Captain does, but have never seen him. Couldn't you publish his picture and

(*Continued on page* 52)

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POPULAR AVIATION

A Magazine for Everyone Interested in GLIDERS LIGHTPLANES MODELS

Volume IX NOVEMBER, 1931 Number 5

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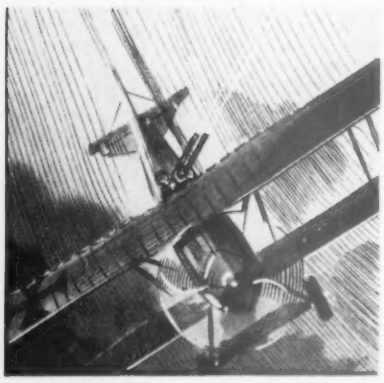
with The

Pitted against the best that the Germans had, the raw pilots of the 95th Pursuit Squadron won notable victories in a series of desperate dog fights.



From Issoudun to Chateau Thierry

AT ONE time or another during the late war, I had two members of rival combat squadrons in the same group tell me that they considered the 95th Squadron the best pursuit outfit working with the American army. Taking into account that both of these airmen belonged to distinguished squadrons, and had fought with the First Pursuit Group from its beginning, I find their statement entirely credible.

The 95th Squadron, they said, had no outstanding aces and, though it had five members entitled to that rating, its real worth came through the exceptional team-work developed—a team-work patterned somewhat on the German system. Though they seldom did work of a flashy character, their splendid cooperation made them formidable opponents. In other words, they were a well-balanced outfit who had a workable system.

THE 95th Squadron was formed in February, 1918, at Issoudun, but did not begin actual operations until May. By then some of its members had been on the front a long while but lacked the necessary equipment to make patrols—their guns were slow in arriving.

On March 1 Sewall, Blodgett and Wooley, chafing at the restraint, took to the air in the 28 Type Nieuports with which they were equipped and made the first patrol of the squadron. Their path lay between Epernay and Rheims at 5,500 meters, and the patrol was an unusual and risky one because they had no machine guns on their planes.

At last the guns arrived, and all the original members of the squadron were in a high state of excitement on the morning of May 5, at the Gengoult airdrome, when the First Pursuit Group was officially formed. The group did not reach full strength until May 31, the date on which the 27th and 147th Squadrons arrived, but long before that time the members of the 95th, emulating their friends and predecessors, the 94th Squadron, began to get a taste of war in the relatively quiet area extending east from the Argonne and centering on St. Mihiel.

In those days one would scarcely have believed that this region was destined to become the scene of the bitterest fighting engaged in by the

Daring Adventures of the 95th Squadron

Illustrated by H. R. Bollin.

By Lieut. James M. Richardson, D. S. C.

American forces. The enemy was neither numerous nor aggressive and combats were infrequent.

Hall and Lufbery lent their valuable assistance to the 94th Squadron and helped them commence operations on April 14. That same day two enemy planes blundered into our territory and were shot down by pilots of the 94th Squadron without loss of a man. The moral effect of these victories was tremendous.

Unfortunately, Hall was shot down in combat on May 7, 1918, in the vicinity of Pagny-sur-Moselle and the Germans made him prisoner. Two weeks later Lufbery was flying over Toul and spotted a German machine of a new type—an armored triplane, the first of its kind that had been seen. He dived swiftly to cut it off from home, and in the ensuing combat the Germans set his plane on fire at a high altitude. Rather than be burned to death, Lufbery jumped out of his machine at 2,000 feet and was killed in his fall.

IN ONE of the earliest patrols of the squadron "Dick" Blodgett, who was one of the trio that made the famous flight without guns on March 1, had an exciting experience. It was Dick's first trip over after he got guns on his plane, and he was one of a formation of four.

The four Americans cruised about some time and finally found two German two-seater planes which had been making a reconnaissance flight on our side of the lines. They engaged the Germans in battle, two Americans attacking each of the enemy. In the first dive "Dick" saw his companion pull out of the fight with jammed guns. He immediately closed in on the hostile plane and blazed away at it as fast as he could shoot.

Each time the German gunner made it too hot for him, he maneuvered about and attacked from a safer position, in this way finally putting the rear gun out of commission.

On May 17, "Dick" and Sumner Sewall were ordered to protect an observation plane on a mission into Germany. Within the enemy lines they were attacked by a superior number of hostile pursuit planes and "Dick" engaged one in a hot battle, finally forcing him to the earth.

Around the end of May, Wilfred Casgrain set out on a patrol and while seven kilometers behind the enemy lines encountered two Albatroses that gave battle. Maneuvering his 28 Nieuport skillfully, Casgrain managed to hold his own in a hot combat that ranged about the sky until they were nearly over the city of St. Mihiel.

CASGRAIN saw the fabric on the upper left wing of his plane peel off and flutter out behind in long streamers. Almost instantly he felt his plane whip into a tail spin and go cork-screwing towards the ground at great speed. In spite of the fact that the enemy might pursue his machine in the dive, Casgrain felt that he would have trouble in coming out of the spin and, therefore, he started at once to get his machine under proper control.

His plane thrown out of balance by the loss of wing covering, Casgrain had a problem on his hands. Centering his rudder bar and pushing forward slightly on the stick, time and again he almost swept out into a normal line of flight, only to go back into the spin and resume the downward plunge. Each second the earth whirled

up faster and faster, but at last he extricated himself.

Casgrain started south and had to hold the stick and rudder hard over to the right to maintain his line of flight. He found that this cost him altitude, and he also lost altitude each time he cut the motor to relieve the extreme pressure on his hands and feet.

He worked down to 200 meters finally and realized he must land, so he accepted the inevitable and began to look for a smooth field. He glided into the first likely place he saw, landing with the wind and stripping the under-carriage from his machine. Convinced that it was France welcoming him again, Casgrain crawled from his wrecked plane and casually examined the surroundings.

JUST then, shouting from the north attracted his attention. He still saw nothing, but, signalling that he had heard, he walked towards the noise. When scarcely twenty yards from the woods, he saw a trench system concealed by overhanging branches. A sinister line of rifles looked out at him, but their owners were concealed.

As he approached, one helmeted figure lowered his rifle and beckoned him into the trench. There seemed little need to argue and Casgrain obeyed. He was a prisoner, having landed in No Man's Land in front of the German front line trenches at Xivray.

John Mitchell, who succeeded Captain Peterson as commanding officer of the 95th Squadron, had a couple of very busy days in May near the spot where Casgrain was forced to land. On the first of these, May 27, he spotted three Germans flying east over Apremont in formation. Nearby he saw a single plane.

Without hesitation Mitchell worked around to a favorable position and dived on the group of three. He placed a burst of forty shots in the rear man of the formation, and the German crashed.

Just three days later Mitchell was flying in the same vicinity and encountered two hostile planes which turned and started for home. He had the benefit of superior altitude and succeeded in overtaking the enemy. In the conflict that followed Mitchell set the German plane on fire and it crashed to the ground.

Towards the end of June, the Group got orders to move to Touquin, in the Chateau-Thierry sector. They pulled out from Toul not veteran fighting organizations by any means, yet well equipped for sterner struggles and possessed of a high morale. Their worst drawback was the machine they flew. It was near the end of July before all squadrons of the group were equipped with the trusty Spad.

AT Chateau-Thierry, the American pilots were pitted against the best that the enemy had, and in the initial phase these fellows carried the battle to our side of the lines. In the Toul sector single airplanes over the enemy positions had been fairly safe, while formations of six had been able to cope with everything they encountered.

At Chateau-Thierry, no matter how many we sent out, we generally met a superior number of the enemy. And among these, with all the skill, courage and science credited to them, flew the members of the famous Baron von Richthofen's aerial circus led by a younger brother of the distinguished ace.

At Chateau-Thierry our Air Service gave up the idea of having pursuit planes protect observation planes to any great extent on specific missions. It had proven too costly, I suppose. Every flight that observation squadrons worked in conjunction with pursuit planes seemed to end tragically. I don't know why the combination invariably drew Germans.

It is a fact that nearly all the famous aces who were shot down met their defeat at the hands of novices—inexperienced fellows who made the absolutely unexpected move. In some cases the novice blundered into maneuvers that ended the career of an ace, in others it was by design.

One of the best-known cases on record is the famous battle of Walter L. Avery. He made his first patrol over the lines on July 25, 1918, and soon spotted an enemy two-seater plane which he attacked vigorously. The affair between the two-seater and himself was growing excessively hot when a brilliant German ace, looking for an inexperienced pilot that he could gain an easy victory over, slipped in behind Avery.

In nine cases out of ten, of course, Avery would have been easy meat.

Just as the German ace opened his guns on Avery, the American saw him. Now the ace was behind Avery and had the advantage of altitude. In front was the other German machine that would have the drop on him unless he made a nose dive. Most any pilot on the front, caught in Avery's predicament, would have dived sharply in the hope of being able to elude the fast single-seater behind him.

WHAT did Avery do? He did the unexpected thing. Whirling about with a rush, he came back up at the ace. If the two-seater shot at him, he was unaware of it; his prey now was something worthy of a man's skill and steel. And how Avery did fly! He made a few fast turns, and the ace was sitting in front of his guns just as he had sat in front of the ace's guns a moment ago.

Avery had the advantage now. He had outwitted the fellow. If only his guns did not jam! He came roaring in behind, touched his triggers and the twin machine guns belched rhythmically. The ace glided straight across our lines and crashed in the woods. It was discovered that the German pilot, who had been made a prisoner, was Menckoff, a German ace with forty-four victories to his credit!

(*Continued on page* 60)

Dewoitine Breaks Seven World's Records

A REMARKABLE monoplane having an extended radius of action has recently been produced in France. It is known as the Dewoitine D.33 and has broken seven world's records on a single flight. During these tests it has been piloted by Lieut. Doret, who, it will be remembered, put up such a spectacular series of stunt flights during the National air races in Chicago last year.

This monoplane is provided with cantilever wings having a span of 76 feet and is propelled by a 650 h.p. Hispano-Suiza engine. As with the majority of the Dewoitine ships, the structure is completely of metal, including the surfacing. It is the purpose of Doret and LeBrix to employ this ship in a flight

Dewoitine in record flight.

from France to Brazil and to attack the record established by Costes and Bellonte.

It is said to have a cruising speed of about 95 miles per hour, and at this speed has broken all records for ships carrying 1,100, 2,200 and 4,400 pounds pay load. The flying distance covered in a closed circuit was 4,662 miles, which is ample to demonstrate its distance ability for the projected flight to Brazil.

Sits Ship Down 489 Times

THE making of 489 landings in an airplane by one pilot in one day is the probable world's record held by Pilot Hudson of Akron, Ohio. Testing a new type airplane brake, Hudson made the 489 flights at the Akron municipal airport. They averaged one minute twenty seconds apart, with a 360-degree turn between the takeoff and the landing, and a full stop at the end of each flight.

XUM

Santos-Dumont, Europes' First Aviator-Constructor

WE have here a recent photograph of one of the very earliest pioneers in aviation who conducted extensive experiments in aerial navigation during the Wright brothers era. This is Alberto Santos Dumont, a Brazilian, who experimented extensively with dirigibles, airplanes and helicopters. His history is of special interest to lightplane fans for the reason that he is the designer of the "Demoiselle," a ship that was quite similar to the modern powered glider.

Dirigibles first attracted the attention of Santos Dumont, and he was the first man to circle the Eiffel tower in Paris with a dirigible of his own design and construction. This was a non-rigid type, but equipped with what would pass as a good attempt at a streamline hull, even in these days. It was said of him, at this period, he held the world's record for vertical

A recent photograph of the famous Brazilian flight pioneer who was Europe's first flyer.

falls. He escaped the many accidents as though by a miracle.

His first adventure in aviation was an airplane built upon the old box kite principle with a canard or leading type tail. This ship is recorded as performing the first sustained flight in Europe by a heavier-than-air machine, the date of this first flight being November 12, 1906. The supporting surfaces were of the biplane type divided into cellules by six vertical curtains which were then called "skid curtains."

In 1907 he began work on a monoplane, and after a great deal of experimenting finally produced the little Demoiselle monoplane. While this is one of the earliest monoplanes, it has been given little credit by aeronautical historians because of its rather erratic performance when in flight. This difficulty was largely due to the short, stubby, deeply cambered wings, which if substituted by modern wing sections would undoubtedly show excellent performance.

The Electric-Eye Picks Up Beacons and Signals

THE photoelectric tube, or electric eye, can "see" an airport or airway beacon in spite of a fog so heavy that the human eye cannot help the aviator. Apparatus for so locating airports in heavy fogs, either in daytime or at night, was recently exhibited and demonstrated by the General Electric Company.

Those who have driven an automobile through a fog appreciate how difficult it is to judge distances of oncoming headlights, and how hard it is to see the road through the glare caused by one's own headlights. The fog, contrary to general opinion, does not absorb light but disperses it.

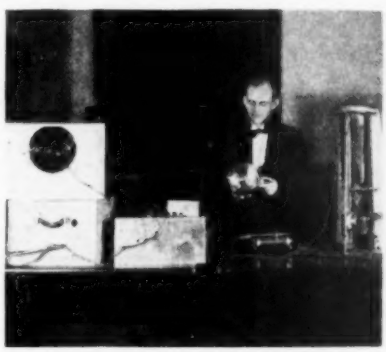
Instead of traveling in straight lines from the light source to the eye, the light rays are deflected and reflected between the particles of moisture in the air, so that the light is thoroughly dispersed and is traveling in all directions by the time it has gone a little distance from the light source.

The result is that the human eye can not see the light source, but is aware only of a possible general increase in brightness of light, depending on the nearness and intensity of the light source.

The photoelectric tube, sensitive to slight differences in light intensity and capable, with the assistance of other vacuum tubes, of converting such light intensity changes into electric current variations which can be greatly amplified and put to work, has been made into an airport beacon finder.

Back toward the tail of the plane there is mounted a large photoelectric tube. In front of it is a mirror rotating at about 100 revolutions per minute and mounted so that the mirror rapidly reflects light from windows on opposite sides of the plane to the photoelectric tube.

Two instruments on the instrument board in front of the pilot are connected to the photoelectric tube and its amplifying unit. The first instrument measures comparative light intensities on the opposite sides of the plane; the second measures absolute intensity of the light.



The Electric Eye Demonstrated.

The first shows whether the airport light is to the left, right or directly in line with the nose of the plane; the second shows whether the aviator is approaching or going away from the light.

The human eye would be unable to notice any differences in the amount of light through windows on opposite sides of the plane, but the photoelectric tube determines even slight differences. Since the fog so thoroughly and uniformly disperses the light, the amount of light reaching opposite sides of the airplane differs according to the direction of the light source.

If the photoelectric tube responded to all kinds of lights, it would be useless, since city lights and similar sources would affect the instrument. The pick-up device in the plane, therefore, has been tuned to respond to light flickering at the rate of a thousand times a second.

Light with such a flicker cannot be obtained if using an incandescent or arc light, but can be obtained by using a 1,000-cycle pulsating current with neon tube at the airport.

A CORRECTION

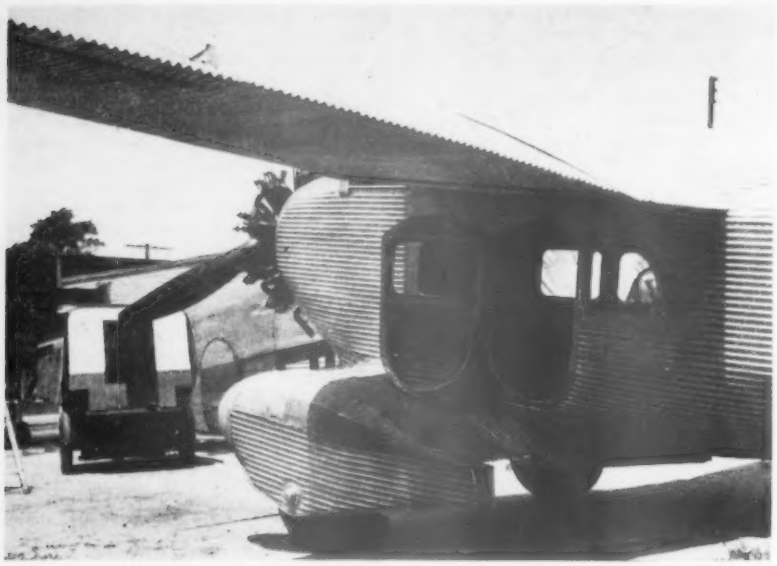
In our September issue we carried a notation in reference to Pilot C. W. Lehr who came down in a forced landing on a farm house due to motor failure at Glenview, Ill. Our notation said that Pilot Lehr who instructs for Curtiss-Wright was carrying a passenger at the time and was at 1,500 feet when his motor failed.

Charlie Lehr who is a well-regarded young pilot dropped in to say that both we and the newspapers stated the story inaccurately. He states that he was taking off with a student and had gained an altitude of approximately 200 feet when the motor suddenly went dead. At this point according to Pilot Lehr, one of those unfortunate mix-ups occurred as to who had the stick, leaving the plane for a moment pilotless. The atmosphere was very gusty, he said, with a 30 mile wind blowing; a sudden gust of wind at this juncture carried the plane suddenly downward out of control.

Pilot Lehr points out that he had no choice in choosing his landing field under the circumstances.

Well, it just seemed to be one of those unlucky situations that happens to the best of us, and everyone was able to walk away from the landing none the worse for wear.

Diesel All-Metal Ship Built for Mexico



An all-metal high-wing monoplane with sheet-metal "pants."

A NEW all-metal airplane of unusual design is being completed in Los Angeles under the direction of Harvey Crawford, veteran airman. When completed, the plane will be taken to Mexico by Col. Gustave Leon and Lt. Alberto Calzadiaz of the Mexican army, where an endurance flight will be attempted by the two Mexican aviators.

The plane, when completed, will be equipped with a Diesel engine. The net weight is 1,400 pounds. Gross weight of plane with two pilots, four passengers and fuel will be only 2,500 pounds. The wing spread measures 39 feet, and there is a 125-gallon fuel oil capacity.

The plane now is equipped with a gasoline engine for trial flights, under the direction of Miss Fifie Malouf, aviatrix and vice-president of the Crawford All-Metal Airplane Company.

Permits Demonstrations for Prospective Students

PROSPECTIVE students of flying schools approved by the Department of Commerce now may be given demonstration flights during which they may be permitted to handle the controls while the airplane is in flight.

Transport pilots who hold flying instructors' ratings and are employed regularly by approved flying schools may demonstrate the course of instruction to prospective students by permitting such students to handle the controls of aircraft while in flight.

Not more than two such demonstration flights may be given to each prospective student, and the aggregate flight time for both flights may not exceed thirty minutes. A fee may be charged the prospective student if the school so elects.

It is also understood that such a demonstration flight carries no inference whatsoever that the prospective student will be eligible for any grade of pilots license. However, should the prospective student later obtain a student permit and enroll in the school, the demonstration flight or flights may be credited toward the required time.

Shopping Tours Conducted by Airplane

THE Eastern Air Transport, which operates passenger planes from New York to Philadelphia, Baltimore, Washington and the South, has introduced air shopping tours as a regular service. These excursions have become popular with many women of Baltimore and Washington, who can accomplish in one day by plane what used to mean a two or three day trip.

The success of this policy is reflected by the number of women who now make regular trips to New York by plane. Each plane is attended by a uniformed hostess carefully selected by the Eastern Air Transport to make the journey agreeable to passengers. As soon as the ship is in the air the hostess circulates among the passengers, pointing out places of interest and explaining questions in connection with flying.

On the Monday shopping tours coffee and rolls were served on the morning flight and tea on the trip home. The make-up box on each plane was a special attraction—being offered to the women just before the plane reached its destination.

Balloons Deliver Packages

PACKAGES would be delivered to airplanes without requiring them to make a landing, according to the invention of Paul P. Horni, who proposes that balloons be sent up in pairs from the ground and elevating and lowering them by means of suitable apparatus. In brief, Horni's invention is as follows:

Two balloons are connected together by a horizontal cable, with a rudder in between to hold them in proper relation to the wind. Connected to this cable are two arms for grasping and holding packages. At spaced intervals along the cables, that are suspended by the baloons, are signal lamps telling the number of the aircraft station.

The airplane, guided by these lights, passes between the two vertical cables and grabs off the packages they hold. If desired, the apparatus may be made transportable, the lower ends of the balloon cables being carried by a couple of automobiles along the roads.

Women Dispatches Air Mail

POSTMASTER-General Walter F. Brown was amazed to discover a woman dispatcher covering the airmail and passenger plane movements for western air express. Miss Edythe Clements, 24, an employee of the company for more than two years, is believed to be the only woman dispatcher in air transport work in the world.

Her duties include the release of the planes from the field, receiving radio reports of the tri-motored planes en

Miss Clements shows him how.

route between San Diego-Los Angeles-Salt Lake City, computing the flying time to various points when the planes leave terminals and notification to field officials and the Postoffice Department of the arrival of planes.

Photo shows Miss Edythe Clements explaining the operation of the radio telephone receiving set and the teletype weather reporting machine to the Postmaster-General.

XUM

Flying Not as Dangerous as Motoring

Says CAPT. CHAS. W. PURCELL

Our Captain Says That Newspapers are Full of Hooey

IS flying safe? This is the question that every Mother and Dad, who have a prospective aviator in their home, are asking themselves today. The above question is perpetually in their minds, and whatever worry is attached to the flying game rests on the shoulders of these two silent sufferers.

This suffering often runs to complete misery and the cause of this is not hard to find. Every time they pick up a newspaper they read of some airplane accident, but the writer of this "news" usually gives everything but the direct cause. Yea, Bo! They read this "hooey" and think that the flying racket is still a game of by-guess-and-by-gosh—and they wonder if their boy or girl is a good guesser.

Rest your poor old overworked minds, Mothers and Dads, flying is not a guessing game and it is no more dangerous than driving an automobile. In fact, the writer thinks flying is about two thousand times safer. If we have any faith in figures, then a few facts regarding automobiles will not be out of place. Last year some thirty-three thousand people were killed in the United States by automobiles and one hundred thousand were injured.

Your fear of airplanes is mostly due to one fact, and that is, hooey newspaper editors' ideas of news.

The accounts of an airplane smashup, as written in the average newspaper, are enough to give any one the heebeegeebee's. They are usually written by a gink who only thinks of a "bank" as a place to cash a check, and of an "elevator" as something you ride in. Nothing is ever said by this aforesaid gink as to the direct cause of the accident. They usually try to get the opinion of some local politician, who never flew a plane in his life, as to just what caused this fatal wreck.

You never read that the pilot was drunk (for this has caused a lot of "students" deaths in the flying game, just as it has in the automobile game), you never read that the pilot was trying to do something he was told not to do until he had more hours in the air. You never read that the pilot was flying a ship that should have been junked because of its antiquity. No, you read none of this.

The palooka newspaper editors don't care if it was a student pilot doing any of these things. What they want is a good story, and if the story isn't there, the majority of this group of imbeciles will make one up by sending out one of the above mentioned ginks to write the story up. When the gink gets through writing, the average aviator will have to guess whether he was reading of a new dance, or whether the lithographer thought he was playing a new baby grand.

Bystanders will claim that the ship was thrown into a spin by the failure of the airport superintendent to flag the ship in. Mr. So-and-So, our well-known council men or what have you, will take steps to see that this kind of an accident will not happen again. This is typical of an airplane wreck writeup. The author wouldn't be surprised to read this one some day.

Lay off this cloak of worry, you Mothers and Dads, and don't let these ignorant yahoos get your furry quadruped. Just stop and think. Go over as far as you can, the wreck of any airplane and nine times out of ten you will find that one of the above causes will cover the case at hand.

There is one class of smashup that we will always have with us and that is mail plane crashes. On bad days in the flying racket, that is, on days that are foggy, with a low ceiling and stormy, the "no passenger" signs are hung out. This cancels all passenger trips, but the mail pilot digs around the hangar and finds his chute pack. (These are only worn in stormy weather now.) The mail must go through—these mail hoppers are supposed to take it through—and they do. Only once in awhile do they miss.

Flying through fog for hours at a time, they sometimes miss their station and run out of gas which necessitates a forced landing. When they have a bad mail-plane crackup it is to be expected, just as the wreck of a big steamship can be expected in stormy weather. We can count these mail smashups out. But even if we left them in, did you ever stop to think why there are so few smashups in this kind of flying, and why so many old-timers are still drawing down paychecks from the flying game?

If flying is ten percent as dangerous as the above mentioned ginks try to make it, why do so many mail pilots live to a ripe old age and die of anything but a smashup? Is it because the average newspaper editor is the world's biggest and best idiot, chump, sap, and ignoramus when it comes to aeroplane accidents?

In the following paragraphs we are

Below, "Monty" Moulton with a trifling 8,500 hours in the air. Right in circle, Capt. Clare Vance—the peer of them all.

going to show you why this is true and back it up with a few little innocent facts. These facts will be living old-time mail pilots, who are still living, in spite of the newspaper editors. The author can personally vouch for each of these men, their flying time, and their accomplishments. He has known most of them since hector's grandfathers were pups.

Now, just taking them as we think of them, we have old man Mouton. His full name is Capt. Edison E. Mouton, and today he is supervising inspector of the Department of Commerce at Oakland, Calif. Monty, as he is commonly called, started flying in France in the early stage of the World War. He started to fly just after they got through using pistols in air fights, and when a good Irishman could have thrown bricks with better results.

When the war was fini, Monty came back and flew mail out of Cheyenne until 1927. In that year he went to work for the Department. Now we come to the interesting part for the Mothers and Dads. All the "fatal smashups" in his flying career can be covered by fifty cents cash and this was for a tire puncture! Laugh that off, some of you editorial nit-wits.

The next one we think of is old man Fillmore. Full name, Capt. William Fillmore, otherwise known as "Bill." This guy started flying in 1916. He picked 'em up and laid 'em down on everything from a city lot to a county farm. When he started flying, the word "airport" was still to be born. It was "Airdrome" and a "airyplane" was just one of them gol durned things.

Bill finally went into the army as a night flying instructor, the first one the army had. When the war was over (that should make a good title for a song), Bill flew mail out of College Park. Then he took to Test Hopping, and now he runs one of the largest flying schools in the west. Smashups? Hooey, Madame and Dad. One dollar and six bits would cover the damage of his fatal smashups. (Giggle that off, you goofy scribes.)

Then we take on old man Doty. Capt. David E. Doty, if you wish to be exact. This bird has flown since 1915, and when I say flown, I mean just that. I have forgotten when Dave started flying mail—it was so far back in the dark ages of the flying game. Ennihow, he is still with his first love, still flying mail and passengers. He hops one of these big apartment houses—the Fokker-32. These crocks are so big they have to have a telephone system so that the pilot can talk to the co-pilot.

Dave did a lot of barnstorming when he got out of the army after the war, and if there's two brands of flying that takes lots of judgment, this barnstorming is both of them. Barnstormers of the earlier days had to be able to fly from strange fields daily, fly overloaded ships, keep an eye peeled

(*Continued on page* 58)

Propeller Driven Car Proves Speedy

This windwagon proved an attraction at the race.

ONE of the attractions at the recent National Air Races was a little propeller-driven motor car that scurried about the flying field like a ground-loving bumblebee. Before the races started, the car traveled nearly 500 miles in four days, delivering race invitations to officials in the vicinity of Cleveland.

The car has a framework much like that of a modern airplane, constructed throughout of welded steel tubing. It is mounted on four airplane tailwheels equipped with low-pressure tires. The motor is placed on a platform behind the one-passenger seat, and the propeller is mounted directly on the shaft. A wire guard surrounds the propeller. The engine is a converted four-cylinder motorcycle type.

J. C. Canfield of Cleveland, Ohio, built the car for advertising purposes. In tests, he made 75 miles per hour over smooth pavement, and still did not have the propeller revolving at maximum speed. Engine controls correspond to those in an airplane.

Non-Flam Gasoline

TWO young Frenchmen have just perfected a non-inflammable gasoline for use in airplanes. The fuel is obtained by subjecting ordinary gasoline to special treatment, and it is utilized like gasoline except that the carburetor

"She will not burn," says Gaston.

requires modification in the shape of a hot air conduit.

In recent tests neither flames, electric sparks or red hot pokers could ignite the fuel. The Frenchmen do not intend to make money from their invention, but will give their secret to the world to advance aviation safety.

This Pilot Knows His Bees

BECAUSE Pilot La Tour helped tend his father's bees when a boy, he was able to avert a disaster recently while in charge of a plane carrying himself and five passengers.

A hive of bees, being shipped in the plane, got loose while the plane was flying and invaded cabin and cockpit. The passengers were able to protect themselves to some extent from the stings by putting blankets or shawls over their heads, but Pilot La Tour had no such defense, nor could he land the plane at once without serious danger.

That is where the pilot's knowledge of bees saved him. He knew that bees swarming out of a hive seldom sting unless disturbed. He continued to fly the plane, but made as few movements as possible and made those very slowly.

As a result he was able to bring down the plane safely with bees swarming all over his body but at the expense of only one or two stings for himself and a few more for the passengers. Once on the ground, the bees were induced to swarm around their queen, who had remained in the damaged hive.

XUM

Former Enemies Now Friends

AT the National Air Races, the German ace, Ernst Udet, met the only American of the 62 allied fliers he shot down over the western front. The American is Common Pleas Judge Walter B. Wanamaker, of Akron, Ohio.

On July 2, 1918, Udet, then only 22 and a veteran of the German Air Forces from the beginning of the war, was flying high over Chateau Thierry. He was returning to the German lines after an unsuccessful pursuit of a French air-raider when he spied a squadron of French Nieuports in a dog-fight with a group of German Fokkers. In his red Fokker, Udet picked out a Nieuport that was hard on the tail of a yellow Fokker which, in turn, was chasing another allied plane. In that rear Nieuport was Wanamaker.

But let Wanamaker tell what happened. "I remember I was on 'standing alerts' duty, from 4:30 to 7:30 that morning, when at 7:20 a call came in that a squadron of enemy aircraft was seen over the lines at Chateau Thierry. Nine of us immediately took off. We went up to 16,000 feet and circled about on the lookout for the invaders, but the haze was pretty thick. We

They are comrades now.

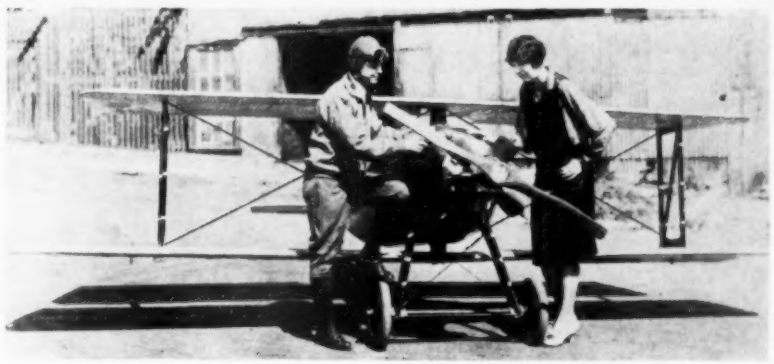
were about to give up and turn back when we suddenly came upon them.

"There were eleven planes in the Garman squadron against our nine; but we went after them. It was the most thrilling dog-fight I've ever seen and the second longest air fight of the war—lasting 32 minutes.

"I suddenly discovered that a red Fokker was pouring lead into my plane, and I tried to evade him by going into a tail spin. But I couldn't fool him. A bullet struck my gas tank and another hit the propeller. Gas rushed into my face, my mouth and my lungs. Then I tried to go for the French lines, but the man I later learned to be Udet, was still hovering over me and still firing. I couldn't make the French lines that way, so I turned and swooped down to the nearest open spot I could find. I don't know how I got out alive for the plane broke in two at the cockpit."

Wanamaker came out of the crash with a fractured leg and other injuries.

Baby Racing Plane Attains High Speed



This little ship looks like a toy but can do 140 miles per hour.

AND here we see a real lightplane, almost a baby plane in respect to size. By comparing it with the pilot and his girl friend we can appreciate its diminutive dimensions. It is not a toy, but was built in Sacramento, Calif., for racing and exhibition purposes.

This little ship is both the smallest and the fastest ever built around a 20 horsepower engine, for it has attained a speed of 140 miles per hour over a measured course. The wing span is only 14 feet.

Modify Cowling Regulations

A RECENT modification of policy by the Aeronautics Branch, Department of Commerce, permits manufacturers or operators of aircraft which have been previously approved without auxiliary cowling over the engine, to install such equipment without submitting drawings to the Department, and without submitting the airplane for flight test.

The procedure to be followed under this policy will be for the manufacturer or the operator to contact the nearest Department of Commerce inspector so that the installation may be inspected to determine its suitability.

The weight of all installations of this type, if approved by the inspector, will be added to the approved empty weight of the particular airplane in question and the pay load reduced accordingly.

The Department however, reserves the privilege of requiring a test flight on any airplane with such installation if, in its opinion, the installation of such auxiliary cowling would seriously affect its flying characteristics.

Novel Screw Propellers Used

HERE is something new that has created a great deal of sensation in Vienna. The inventor of "propless" airplane is J. Frech, a Viennese engineer, who has conceived the idea of future flying without propeller. Instead, a pair of huge screws are installed under the body of the airplane. They revolve on their own axis by means of air pressure. The inventor claims that he can reach higher speed than the present method.

A "close-up" of the screw or helix drive system.

Electrical Weather Map Makes Navigation Safe

Small lamps studding the map indicate weather conditions.

ELECTRICAL weather maps, developed and constructed by the Navy for assisting aviators in rapidly visualizing actual weather conditions, are now in operation at the Naval Air Station, Anacostia, D. C. Current weather conditions in various localities are shown on the maps by means of colored lights. Attention to marked changes in conditions and storm warnings are indicated by changes in colors of lights as well as by bell signals.

There are three maps in the system now operating at Anacostia, one in the Commanding Officers' office, one in the pilot's rest room, and the third in the Aerology Office. Weather information from points covering the Atlantic Coast, and across the mountains into Ohio, are received from 36 stations by means of naval radio.

Calls by radio and telephone from seven Army stations and by hourly teletype reports from the Weather Bureau and the Department of Commerce. Reports from twenty-three stations are on regular hourly teletype schedule, and reports are received from almost all other stations every two hours. Lights on the new maps are turned off when the report becomes two hours old.

Good flying conditions are shown by white lights; undesirable flying weather is indicated at the various points by green lights. Fogs, heavy winds and gale winds are indicated on the maps by red lights. The area covered by the map at Anacostia is divided into three general zones. Along one side of the map is a strip panel on which are shown flying conditions prevailing in the three zones, and the force of winds at various altitudes within the zones.

Expected changes in weather conditions are indicated on the map by the burning of two different colored lights. Electric bells attached to the maps are used to call attention to the shifting of the colors of lights, and prolonged rings are used as warning of squalls, thunderstorms or line squalls.

Seaplane Lands in River Bed

FLYING a navy seaplane from Long Beach, Calif., to Glendale airport, N. J., Jones was faced with an unusual problem recently. While flying over the dry river bed of the Los Angeles River the plane ran out of gasoline. Faced with necessity, Jones brought his plane down to a safe landing in the river bed.

Hundreds of motorists and residents of the vicinity watched with bated breath while the pilot circled lower and lower, with motor dead, until the plane was barely skimming the tree tops. Spectators were relieved when the wheels of the plane touched the dry sand of the river bottom and the pilot climbed out unharmed.

And what was more, he made a safe getaway from the unusual landing place with the help of several spectators. While the helpers held the wing, Jones whipped the plane about to head into the wind and took the plane from the ground after a short run. He had borrowed some gasoline from a nearby baking company garage to enable him to be on his way again with only a short delay.

Lincoln Beachey, Premier Stunt Flyer

AN EXHIBITION flyer—par excellence! That was Lincoln Beachey! His flying career reads like a fairy tale, and perhaps in the annals of flying would be hard to duplicate. His daring and audacity were the talk of the Nation.

No fair or country gathering was complete without Beachey and his "Flying Machine." To give the people a thrill was the aim of his life. He liked to see them stand with open mouth, staring eyes, and awe-struck faces. Perhaps, feeling secure, and knowing his machine, he felt there was no danger attached to the things he did.

It had long been his secret ambition to fly under the Niagara Bridge, but events and circumstances had succeeded in preventing the "Suicidal Act," as it later become known.

But the opportunity was at last to be his. He had flown, during his cross-country "barnstorming" to Niagara Falls. The day was auspicious, and everything conducive to good flying. His ship had been tested under varied and trying conditions. He held no fear of the tricky air currents which he knew likely to exist in Niagara chasm.

Lincoln Beachy on front porch.

Soaring high above the city Beachey put his ship through its paces. Like a well-trained animal, it obeyed his every wish.

Thousands of necks were craned upward, for it had been noised about that Beachey was to do some stunt flying that day. But it was a surprise to many to see him headed for the falls.

Above Horseshoe Falls Beachey looked down. It was only a glimpse, but the water was a mighty boiling pot. Constant waves and gusts of vapor rose as the water crashed over the precipice. Far down the river, in the chasm, bobbed "Maid O' The Mist," passenger and pleasure boat.

A strange passion assailed Beachey. "He'd like to give those pleasure seekers a thrill that they would not forget in many a day!" He swooped.

As though clutching him with relentless fingers, an eddy caught him. They were sucked down, down, down—They were in the chasm! No backing out now.

Then came his dauntless courage. "I can make it!" he decided, and put every

(*Continued on page 56*)

Trouble-Shooting *with the* Air-Mechanics

by K. HUGHES

Formerly Chief Field Mechanic for Travel Air Corporation

Perplexing Difficulties Experienced in Making Field Tests of Engines and Airplanes of New Design

AIRPLANE and airplane engine troubles are frequently baffling. While engines have been highly perfected, and the ships are free from many of the disorders experienced in earlier days, yet the elements of disguised trouble still exist. "Trouble shooting," therefore, and all of the grief and worry that go with this job, still exist and—to the bystander only—frequently introduce a note of comedy into the proceedings.

A generous piece of rag with two feet of copper safety wire wrapped around it for a handle makes a good swabbing tool for some aspiring lad in the factory, but it doesn't improve the performance of an engine when left inside. Oil pressure is one of the things that we like to have plenty of when blasting out an engine for the first time on a factory testing ground.

We have a score of other items such as: temperature, maximum revolutions, idling, smoothness of acceleration and vibration to contend with as a matter of routine without having the unexpected turn up. Yet things like that mentioned above do happen and we sleuth around like amateur detectives until the trouble is located.

Occasionally, something more unusual develops and then we have to roll up our sleeves and go after Old Man Trouble in earnest. Take the case of a Challenger engine which caused us no end of trouble until we uncovered the fault. This engine was installed in a Travel Air biplane and equipped with a Heywood compressed air starter. A very satisfactory starter when properly installed.

On a good many engines, it is customary to discharge the surplus air compressed into the crank case for cooling the engine internally; the compressor being built in such a way that it operates continuously while the engine is running. The conventional hookup was followed in this instance but our troubles commenced a few moments after the engine was started. Oil literally flowed out of every crack and crevice in that engine. It spewed out the top and ran down the sides. The prop whipped it back on the ship and the ground beneath was a regular pool of perfectly good Kendall "J."

We shut the engine off, washed it and started it up again—with the same results. After a good deal of experimenting, testing—and washing we arrived at this conclusion. The air being discharged into the crankcase, did not have sufficient means of escape and was building up pressure. This caused the oil to load up in the engine, seep through the joints and seams and even to be thrown out through the breather by the force of the escaping air.

Mechanics removing engine for an inspection of the carburetor or ignition system at the rear of the crankcase.

* *

Note the engine ring at the nose of the fuselage against which the engine is bolted when mounted in place. The use of a trolley hoist in the shop makes this easy. Not so easy in the field.

* *

Before removing the engine, all of the gasoline and other piping must be disconnected together with the ignition wiring, etc. This must again be connected when the plant is reassembled.

It is not unusual for a Challenger engine to throw oil out the breather anyway, but only when the oil is cold and heavy. We disconnected the crankcase air line and discharged the compressed air into the open, thus ending our trouble and taking a load off our minds.

Another thing, which was a matter of routine and very important, was draining surplus oil from the cylinders before starting the engine.

New engines come crated from the factory, coated with a rust resisting grease and carrying about a quart of oil in each cylinder. This is for protection against long storage or salt air.

It is customary to drain this oil when the engines are being washed prior to installation. Sometimes the boys slip up and an engine comes out on the line with one or more cans still full of oil. For that reason we always pull the engines through by hand before starting them up.

One day a test pilot, in a good deal of a hurry, climbed into a six-place cabin plane which was setting on the line and without further ceremony pushed the starter button.

NOW, a regular Eclipse electric starter is a mighty powerful little piece of machinery. It contains a little flywheel which is turned up to thousands of revolutions per minute by a geared electric motor in much the same manner as a cream separator is wound up by hand. This particular engine, a Wright 300, had not been inspected.

The electric motor ground away merrily, winding up the little flywheel tighter and tighter until it seemed it was ready to fly out in a million pieces. At this point, the pilot chose to cut in the ignition switch and pull on the starter button! The flywheel, moving at a terrific speed, engaged the engine through a clutch and snapped it over! A couple of cylinders fired, the engine started, then hit a cylinder full of oil. You know the rest—you can't compress oil.

Well, it blew one cylinder off; broke the connecting rod off below the piston and shoved the stub up the next cylinder. No need to mention we put a new engine in that ship!

Another thing I ran into, and which stumped me for awhile, was a cylinder full of gasoline instead of oil. I was pulling an engine through by hand one day when it hit a snag and stopped

dead. The prop almost jerked the fingers off my hands. I pulled the spark plugs on the bottom cans, expecting to find them full of oil. Instead a stream of raw gasoline gushed out of one of them and went trickling down my pant leg. I finally figured it out but it took me some time.

On investigation, I found the primer valve had been left open, and checking back a little further, found the center section tank valve on. Putting two and two together it worked out like this: Gasoline drained from the center section tank down through the primer and then through the small primer line into the intake manifold. Continuing down the intake manifold until it reached a bottom cylinder. As luck would have it, the engine had stopped in such a position that the intake valve was open.

At the end of the intake, the gas was following and the cylinder was completely filled. It must have taken hours for this to happen. And although I have found primers open and wing tanks on since then, I have never found another cylinder full of gas. The reason lies, as I see it, in the fact no other engine happened to be setting in the right position to have the intake valve open.

ONE of the major catastrophies we suffered was losing a plane by fire and like most fires, was avoidable had proper care been taken. From the time this plane hit the final assembly department until it was a smouldering mass of twisted tubing, we had been rushed to get it out. The fuselage was faired out round to fit in with an N. A. C. A. cowling that the engineering department was developing. A special built job and powered with a 240 Wright.

The cowling was a bone of contention among many of us. Being some trouble to install, it was put on in the factory and wheeled out on the line ready to start. Individual short exhaust stacks were completely hidden by the cowling and constituted a hazard—hard to overlook.

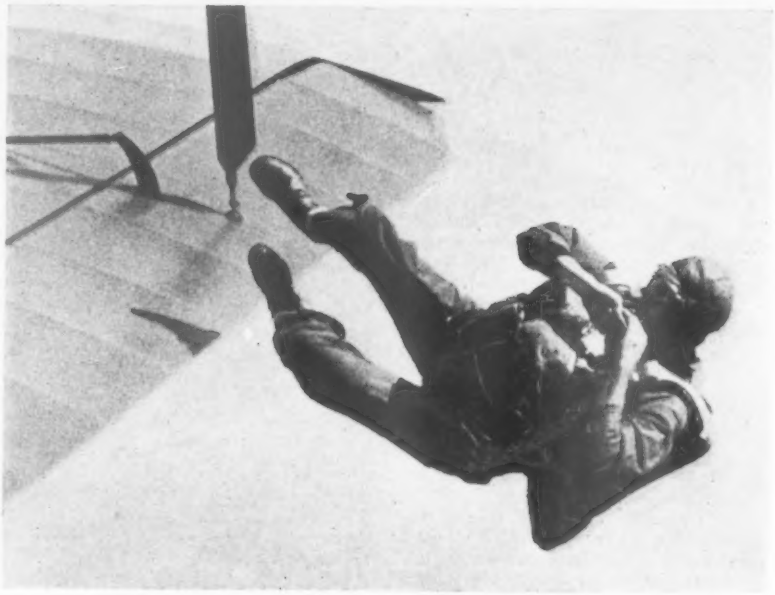
Now, the starting of a new engine is invariably accompanied with the throwing of immense clouds of white smoke and fine oil spray—surplus oil in the process of combustion. That is why it is desirable to have an engine exhaust in the open when starting for the first time after coming from the factory.

In this case, the engine started at a fast clip. Oil was blasted out of the cylinders and plastered on the inside of the cowling. Hot exhaust gases flickered in and out of the short stacks and white smoke effectively screened the flames as they licked at the coating of oil on the cowling. A few moments of this sufficed to send the whole creation up in smoke. Had the engine started at a slower speed it might not have burned.

Sometimes engines start off at the speed we want, sometimes they start off when they shouldn't and sometimes they refuse to start at all. Occasion-

(*Continued on page* 53)

What Is the Expression on His Face When He Bails Out?



This photo was taken at the instant of bailing-out.

CORPORAL GARLAND E. CAIN, connected with the Parachute Branch of the Air Corps, was curious to learn the various facial expressions registered by one going through the motions of an actual parachute jump. Of course, there was only one way in which his curiosity could be satisfied, and that was through close range photography.

"Everybody asks how one feels when jumping from a plane high in the air," said Corporal Cain. "The man who jumps seldom can describe his sensations after his parachute has brought him down safely. The strain of the descent immediately is gone. The look of concern that he wore when 'bailing out' changes to a broad grin of satisfaction the instant contact is made with Mother Earth.

"It seemed worth while to try to take some pictures of myself in the act of making a parachute drop, which, if successful, would be a permanent record of facial expressions on the way down.

"How to do it was the problem. The parachute drop itself would be easy. I had already made six. Another would be just one more. But how was one to get a camera compact and light enough to be carried, and capable of focusing sharply out at arm's length? The answer was so easy as to be startling.

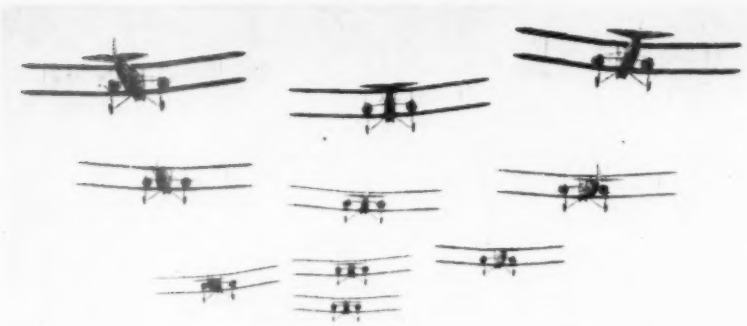
"A Brownie box camera taking vest-pocket pictures would do. If by chance it became lost or broken, the cost would be just a dollar and a half. The only adaptations required were the soldering of an extension piece on the finger lever for easier snapping and the riveting of a ring for a lanyard to lessen the risk of losing the camera. Two of these cameras were fitted up, marked with white chalk so that they could be distinguished.

"Permission was had to make a jump at Chanute Field on August 3rd. The sky was cloudless and the wind was not over seven miles an hour at any altitude up to 4,500 feet. I took position on the right wing of the only Keystone Bomber at the Air Corps

(*Continued on page* 48)

This is the way he looks on his way down.

There Are Many Laughs at The Navy Air School says Lieut. A. A. Agelou



A typical student formation flight with bombers.

IN COMMON with other industries, aviation has suffered a decided reverse in the recent unpleasantness which everyone calls a "depression." This avoids the use of the older but harsher word "panic." There are a legion of mourners who "took it on the button" when aviation stocks in common with others, jumped from their altitude hop and the parachute failed to open.

It is unfortunate but true, that as a result, the aviation industry has become something of a study in blue. Mail pilots who, in the boom days, cashed checks for as much as $2,000 each and every month are glad to accept checks of considerably smaller amounts. Optimistic investors who were gayly spending dividends are wondering when the next check will come and how small it will be.

But, through all the vicissitudes that have assailed it recently, the aviation industry has maintained a note of optimism. There is a lighter side to aviation. There is humor in the sky.

* * *

THE tail spin has always been regarded with a certain amount of dread by pilots, and particularly by students. In the early days of aviation, before the technique of coming out of a spin had been perfected, the spin was regarded not unnaturally, as the last flying activity of a pilot.

Before the War, the U. S. Government offered to train several Brazilian Naval Officers at Pensacola. One of these men, an engaging youth named Pédro, had endeared himself to his classmates by his fine personality and the nonchalant manner in which he accepted the daily reverses of student life.

While training in N-9 seaplanes at the beach, this class had watched several of their companions fall in a spin, had heard the eerie wail of the crash siren and had attended brief funeral services two days later.

A group of the class were standing on the beach one day watching the planes over the Bay and making comments on the students flying. Pédro was up for his stunt hop. Suddenly one of the students gasped and pointed in the air. Pédro's plane was falling very sedately into the dreaded spin.

"Poor old Pédro," one of the lads sighed dismally. "He was such a good lad."

They were all lamenting vocally Pédro's imminent demise, when someone cried, "Look!" They all craned their necks to look up into the sky. Pédro's plane was no longer falling, but had come out into a steep glide with one wing down. Then to their amazement, the plane straightened out laterally and came slowly out of the dive. Like a teal duck it scuttled for home and flopped down on the water near the hangars.

Soon Pédro was on the beach surrounded by his excited classmates. "What happened, Pédro? What did you do?" they cried.

Pédro lighted a cigarette and flashed a white smile in his swarthy face.

"Wal, you see, I fall een-to speen. I plan-tee dam' scare, I tell you. Earth, she go 'roun' like ween'mill. I pool steeck back. No good. She go 'roun' dam' faster. I poosh steeck forward. Hard to do. Some bettair. I poosh heem right. More bettair. I pool heem back a leetle. Moocha bettair—she fly along nice. I hurry like Hal' an' lan' before sometheeng else 'appen."

Aviation had learned its first lesson about the spin.

* * *

A CERTAIN flying school has laid great stress on the point that students must always be ready for any emergency. One of the instructors had an unpleasant little joke he often played on his students when they were nearly ready for their solo flight.

He would fly out over some heavily wooded country, unscrew his stick from its socket, hold it up so the student could see it, and drop it over the side. Heavily on the student weighed the responsibility of flying the plane back to the landing field without corrective guidance from his instructor's stick.

Abe Williams was very slow learning to fly, but he possessed an active

(*Continued on page* 64)

Fighting Mosquitoes by Means of Airplanes

THE Health Commission of Venice, California, is seeking an appropriation for supplying oil-soaked sawdust to kill the mosquitoes of the salt marshes running south of Venice. The oil-soaked sawdust would be placed over the marshes from an airplane. The action toward spraying the marshes was taken following the recent receipt of numerous complaints. One corporation had made a bid to do the spraying by airplane, spraying three to four feet from the ground, for $96 an hour providing the city will pay for the material used.

Spraying dust does not kill the salt marsh mosquitoes as it does the malaria mosquitoes, and kerosene or other oil must be used also. The district along that part of the California coast is free of malaria-bearing mosquitoes, but the salt marsh variety breed rapidly and are extremely annoying.

The use of the oiled sawdust prevents the mosquito from getting air and thus it is killed. The Health Commissioner of Venice says of the salt marsh mosquito, "It is the female which bites and is a menace. The male is a gentleman; he wouldn't bite anyone."

Takes to Air at 70 Years

"TOO old for golf, so I'm going to take up aviation."

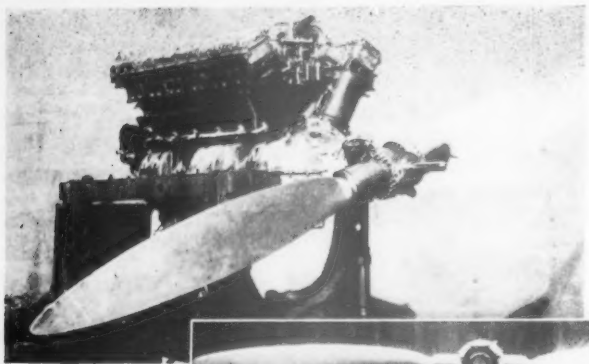
Thus, Wyatt Warren Shortt, age 70, faces retirement from the precise occupation of operating a Santa Fe locomotive. His plan is to take up even a more exacting science—that of sky engineering.

Having reached the age of 70, after

Warren Shortt after landing.

operating freight and passenger locomotives for more than 40 years, Mr. Shortt has become an aviation enthusiast. Indeed, he has passed the government physical examination for a private pilot and is often in the air at the San Angelo, Texas, Municipal Airport, where he is enrolling in the Monsey School of Aviation.

Variable Pitch Propeller Gives Better Performance



At left: Variable pitch propeller, with variation device, mounted on engine shaft in place and ready to operate

At right: Details of blades and hub.

BY changing the blade angles of a variable pitch propeller, the propeller efficiency can be maintained maximum at various forward speeds of the airplane. This is not a new idea basically, for this type of propeller has been proposed from time to time as a remedy for various ills in the power plant. Here we show the Italian version of this principle, the Marchetti propeller, which is said to be very successful.

By decreasing the pitch, the engine speeds up and greater pulling power is exerted on the ship at low speed when it is taking off. When up to flying speed, the angle of the blades or the "pitch" is increased so that the pitch speed bears the most favorable relation to the flying speed.

Safety of Airplane Structures is Assured by Sand Tests

STRUCTURAL safety under all conditions of flight and landing is one of the first objectives of the modern airplane designer. If a ship is not strong enough to be flown with safety, then it had by far better remain unflown.

Almost needless to say, the stresses and loads on the materials are very complex and require very careful analysis by methods that are too involved and complicated to be taken up here, but to illustrate the point it may be said that the calculations for strength are far more complicated than for a bridge or skyscraper structure for the airplane loading is continually shifting, and we are not allowed the latitude in the matter of weight that is permitted with steel buildings.

Fig. 1. Flying load test.

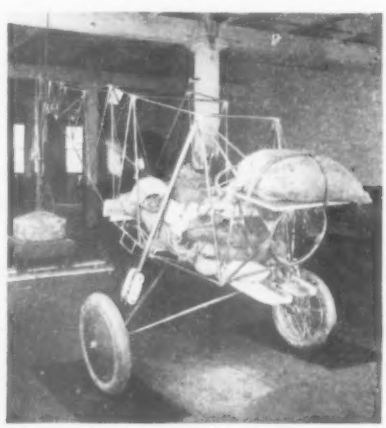


Fig. 2. Landing load test.

After the maximum stresses on each part are determined mathematically, then comes the problem of adjusting the size of these members so that they will stand up under this load without danger of rupture, excessive bending or deflection. It is obvious that a square inch of steel will stand a greater loading than a square inch section of spruce, hence the bearing areas are adjusted for each material employed. With the size of the parts estimated

(*Continued on page 56*)

A Fast-Climbing Biplane

REMARKABLE performances were achieved in tests by one of England's pilots a few days ago. Ascending in a "Firefly" biplane, he climbed to a height of 19,750 feet in two seconds over nine minutes.

The plane's maximum speed was over 210 miles an hour, while in the power dive, with engine full on, the air speed indicator registered 384 miles an hour. The pilot began the dive at a height of 22,000 feet. The highest speed recorded was attained as the machine passed 15,000 feet. He continued the dive till 8,000 feet and then began gently to pull out from the vertical to the horizontal, the machine being at an even keel at 4,000 feet.

Payroll Nears 1,000 Mark

WITH construction well under way on current Army and Navy pursuit plane orders, the Boeing Airplane Company reports that it now has 820 men employed in its factory. This ranks the airplane company as the largest industrial pay roll in the City of Seattle.

Hawks Believes in Speed

THE more I fly, the more I am convinced that speed is the airplane's most important quality. I do not think that this is sufficiently realized even by pilots, many of whom are too prone to suggest that high speed transport planes are too dangerous for everyday work. The common objection to the really fast air-mail ship is that its landing speed is too high. I do not agree with this view. Take my little plane for instance; its maximum speed is 240 miles an hour and it cruises comfortably at 195 m. p. h., yet its landing speed is only about 60 m. p. h. At this speed I have no difficulty in getting into any ordinary field—even a small one.

What about forced landings? I think too much stress is laid on this aspect of flying. Last year, less than two per cent of forced landings in the United States were due to engine failure. Motors are getting to be so reliable that there is no longer any need for a pilot to expect frequent trouble from this source. The time has not yet come when the possibility of a forced landing from engine failure can be entirely ruled out of the air-mail operator's calculations, I do not think that this risk is nearly so great as most people imagine.

Bad weather is really the most frequent cause of forced landings. In 1930 it accounted for 51 per cent of the total forced landings in the United States. Contrary to the view held by many pilots, a fast machine is much safer in bad weather than a slow one. Speed enables a pilot to get through an area of poor visibility almost before there is time to worry him. Again,

(*Continued on page 57*)

Glider Notes for the Novice

by MARTIN SCHEMPP *and* JACK HERRICK

The authors, both nationally noted gliding experts, give wise counsel to beginners in the art of gliding flight

TOWED glider flights, or launching by elastic cords, are a necessity, of course, in flat country. This matter, together with preliminary instructions, was covered in the previous issue.

Gliding from hill-tops, however, is the ideal method and is the desire of all glider pilots who are ambitious to perform soaring flights. It is the purpose of this second section, therefore, to discuss gliding from hills and slopes wherein the maximum of pleasure is derived.

Any old hill, bare and with not too steep a slope, will do for preliminary gliding. The best location for training is a gentle slope from 50 to 150 feet high with a sufficient length of at least 1,000 feet, and a width of about 500 feet. It is desirable that the field at the bottom is leveling off, thus providing both steeper and more gentle slopes.

The slope ought to face the prevailing wind direction because we always have to glide into the wind. A bare hill which can be used on all sides is ideal, for we shall be able to glide with any wind direction. If you pick out a slope, however, see that it is not too close to an opposite hill which will kill the smooth flow of the wind and spoil your slope for gliding. The best hill should not just give us a spot to take off from and to glide down into the valley, but should deliver us also an assisting upwind, thus aiding the lift and lengthening the glide.

A smooth upwind is found only when your hill has a clear, level foreland on the windward side. Then the wind will climb in a smooth current over the hill. If the valley or plain in front of the hill is at least two miles wide and the opposite hill range not any higher than your peak it will do. Trees, rocks, ditches, bushes, fences and telephone or high tension wires shouldn't embellish a glider field. Even if they are not just in the usual flying path, they have too great a magnetic power on student flyers who like to use them as landing marks. At the steep edges of quarries and ridges, twisting air currents are produced which will not give any support to the glider.

In this form of training the PTG with a skid for landing gear is the most common. However, any ship similar to the Franklin may be used just as well.

At first, it is better to give the student some socalled ground flying. This consists of sitting in the glider, facing into a fairly strong wind and practicing the movements of the lateral or aileron control. The pilot should learn to keep the wing level and acquire a feel of the control.

Gliding serenely over the Rhone Valley.

While he is making these movements, make sure that the stick is always in the neutral position for the elevator control. It is a natural tendency of a student when making extreme sideways movements, to also pull back on the stick. Then we will familiarize the student with the abrupt acceleration that is inherent with shock cord launchings.

IN this case, as well as in any kind of airplane flight, always take off directly into the wind. If the wind is blowing downhill or from one side, we have to abandon this slope and take another facing the wind. Here again the limiting wind velocity is 15 miles per hour. Wind direction is quickly determined by throwing a handful of grass into the air and noting the drift.

Choose a starting point near the bottom of the slope. Lay out 200 feet of ¾ inch shock cord in the form of a 40-50 degree V, with the point at the nose of the glider. An iron ring is fastened to the cord at this point by a strap or rope and the ring is slipped up into the open launching hook. Two or three men are plenty on the end of each shock cord. Tie, or secure in some fashion, a ¾ inch rope to the end of the runner.

Note that we fasten this rope to the main section and not to the tail piece. Three or four men holding the rope will act as an anchor. Now drive the fact into the student's head that he must keep the stick pushed forward and thus prevent the glider from taking off. Some instructors even go so far as to tie a strong cord from the nose hook of the glider to the control stick, holding it forward of neutral.

We are in favor of having a short leather strap or piece of rope fastened to the root of the left wing spar, to be held with the left hand. In the sudden, surging start, the student grabs hold somewhere, and very often at the control stick, pulling it back. With this strap the student will hang on to it and feel much safer. Never sling the strap around the wrist or it may result in a sprained wrist.

Have a man at a wing tip hold the wing level and keep it level until the glider has enough speed to respond to the ailerons. Make a final check now, and every time just before the start. Are the controls working, is the launching crew balanced, the anchor crew holding and above all is the safety belt fastened?

THE student should give the starting commands himself, commencing on the very first start. Then he knows exactly when the glider is let loose and will not get nervous while waiting for the commands. The commands are: WALK, the launching crew walks ahead about 10 steps. The pilot now calls RUN, the men run as fast as possible and don't look backward. The pilot watches the pulling crew closely.

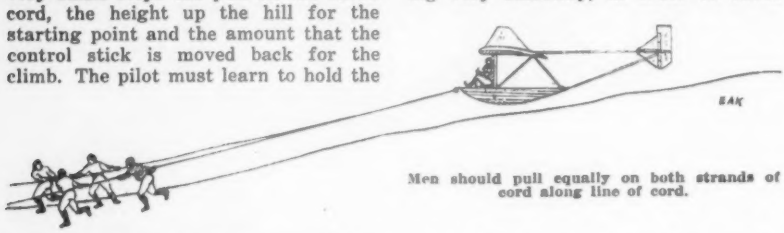
As soon as he sees them slowing down he knows that the shock cord is almost stretched out to its limit and at that point he commands LET GO. The men holding the anchor rope let loose and there goes the glider. That the let-go command is given before the launching crew comes to a stop is important, for then we get also the benefit of the run besides the energy of the stretched cord.

The man at each end of the shock cord always picks a mark in the line of the cord when first laid out. It may be a tree, building, stone, etc. He runs towards this mark and thereby prevents an unequal pull to one side which would cause a bad start.

Make several of these skidding starts. It gives the pilot an opportunity to balance the glider, to use the rudder and to become familiar with the

start. We caution the instructor that most crashes are caused by a pilot pulling back on the stick as soon as the glider snaps forward and his body is thrown against the back rest.

From now on we simply increase in very small steps the pull on the shock cord, the height up the hill for the starting point and the amount that the control stick is moved back for the climb. The pilot must learn to hold the stick in neutral and take off and land with it in this position.



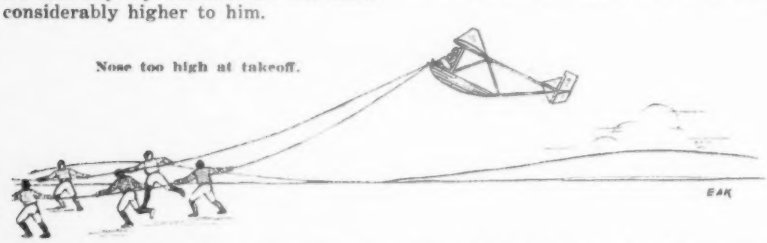
Men should pull equally on both strands of cord along line of cord.

The beginner is shown the correct position of the stick for the start, considering his weight. A student of average weight holds the stick in neutral, for the glider will take the air without using the elevator due to the high lift wings. If the student is light, he must hold the stick a bit forward, if heavier then farther back from neutral.

A good glider, properly balanced, will fly by itself for a short hop. All the student has to do is to keep the stick in the position shown by the instructor. It is advisable to place a large white cloth or piece of paper about fifty feet from the point where the glider is going to land to serve as a goal for the student.

He must keep his eye on this mark during his glide. This will be a great help in keeping the pilot from pulling back on the stick and stalling the plane. It gives him a tendency to point down rather than upward and helps him also to glide straight. It is best to avoid too much altitude. Accustom the student by starting up the slope a little farther up each time.

MAKE short flights of perhaps 75 feet at an altitude of not over 3 feet above the ground. This is plenty for the student to feel that he is in the air and anyway the altitude will seem considerably higher to him.



Nose too high at takeoff.

After several of these short jumps, straight glides from 200 to 300 feet in length can be made, and the student will begin to steer himself. He should preferably carry out two or three consecutive flights before he is relieved. The next one to take the seat should not help pull the plane back up the hill but should stay with the instructor who discusses the last flight with him, pointing out any of his mistakes and if necessary, encourage him.

Of course, every man must be treated individually, one requires encouragement, the other one, checking. After every breakage and sometimes during training, the instructor should fly the glider himself, doing the steering very smoothly, in order to cause the students to trust the plane and to show them that it actually flies by itself.

HERE are a few points which should be heeded in training to avoid accidents. In starting do not pull the ship up too rapidly. Even if you have enough flying speed the ring may slip out of the hook when the shock cord is still under tension and the cord and ring will snap into the pulling crew. To be hit with this cord is to be compared with the kick of a mule and may cause broken arms and legs.

In the flight, the beginner usually over controls the glider and makes it jump up and down. Keep a cool head. Hold the stick in neutral till the plane goes in an undesired position. Now use the controls to get it back into a normal situation. Rather control slowly than too hasty. Soon you will know how to judge the right flying speed from the air pressure on your face and the singing sound in the bracing wires.

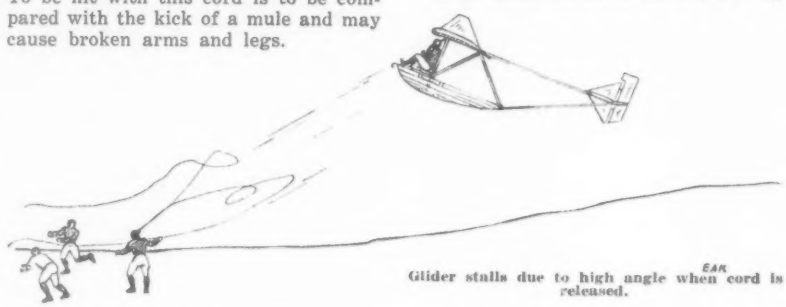
You will learn to steer instinctively. Land in a natural glide and do not pull the ship up before touching the ground. Just let it slide in. By pulling back the stick before landing, the glider will lose flying speed while still 3 or 4 feet above the ground and will suddenly drop and perhaps break the runner. Never try to slide your feet along the ground as a brake, for it might be disastrous.

After landing stay in your seat till your comrades have arrived. With the loss of weight after the pilot has left the seat, the glider may be thrown on its back by the next wind gust and be damaged. Therefore, hold on to the glider in all cases, before the start, after landing and during transportation. It may happen in your glide that you suddenly see an obstacle ahead, say a tree, a bush or a fence.

Naturally you pull back on the stick to clear it. But if you pulled the glider up too early, it loses flying speed and drops right into the bush or whatever is in your way. The right thing to do in this case, supposing you still have enough distance, is, nose your plane slightly down for picking up speed.

Then a few feet from the obstacle pull the stick back and the glider will clear it in a jump. In landing you may see that the glider is sliding towards a rock or bush which may damage it. In this case, drop one wing to the ground using the ailerons. The glider will pivot and slide around in a curve coming to an earlier stop.

What shall we do if there isn't any time to avoid hitting a hindrance? Pull the stick all the way back. Brace yourself in the fuselage. Protect the face with the left arm. It is a good idea to fly with a well cushioned pilot's helmet. The student shouldn't look down any more to the landing spot in the more extended glides from higher altitudes.



Glider stalls due to high angle when cord is released.

He should be looking at some marker on the horizon, which helps him to keep the ship in the correct gliding angle. It is presumed that he is holding his head straight and is not leaning back or forth.

There are two things that will bear repeating. First, is the necessity of learning rudder control quickly, and, second, to obtain a well-trained group of ground men who can keep their heads and know how to pull straight and true. The latter group need almost as much training as the pilot.

Every time that the glider is taken out, it should be thoroughly inspected, not only for alignment, but also for possible fractured members or tears in the fabric. A record should be kept of injuries sustained by the glider, and filed, so that the condition is known at all times. If there has been an accident then this fact should be known to all.

Radio Proves Valuable on Cross-Country Flights

AN unusual test of the value of radio equipment in military aeronautics was recently made on a cross-country flight by three planes. Major A. H. Gilkerson of the material division at Wright Field, Dayton, was holding three-way communication with two other planes over a distance of eighty miles. As he approached Cincinnati his engine started to miss and to exhaust black smoke.

Fearing he might be forced down he ordered Lieutenant W. G. Smith in another plane fifty miles distant to keep a record of his exact location. Although his motor enabled him to gain his objective, Wright Field, and he was not forced to land, the log kept of his plane fifty miles distant was accurate enough to have located him on short notice.

In using the radio on the planes it is possible to keep three-way contact between squadron leader, ground station and squadron leader within a radius of 200 miles. To increase the lightness of equipment and to permit the aerials to be restricted to wing tip to tail lengths, however, this radius has been limited to fifty miles in pursuit planes, as trailing antennae have been found impractical for formation flights.

New Lightplane on Market

THE "Time-Builder" is a small single-seat high wing monoplane designed primarily for building up hours of flying time at a very low cost. It also is intended for the sportsman pilot who does not demand speed or power.

The "Time-Builder" monoplane.

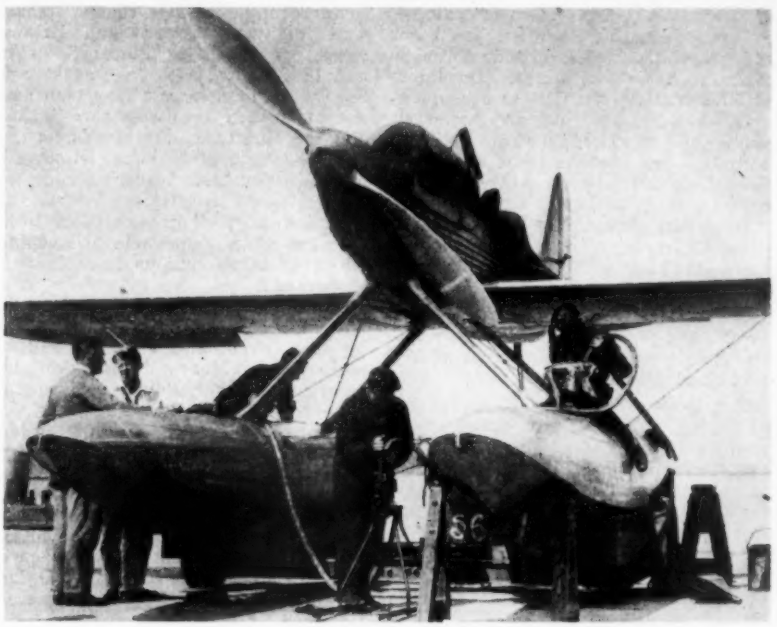
As with many ships of this type, the cost of training is not only reduced but the ship is safer than a high powered ship in the hands of the beginner because of the lower speed.

Specifications

Span	32 feet
Length over all	22 feet 10 inches
Wing area	160 sq. feet
Weight empty	684 pounds
Gross weight	925 pounds
High speed	80 m.p.h.
Landing speed	25 m.p.h.
Radius	250 miles
Price	$1,675.00

Standard equipment provides a 9-cylinder Salmson radial engine rated at 40 horsepower.

Schneider Trophy Race for Seaplanes Is Run for Last time



One of the contesting seaplanes, a Super Marine being inspected.

GREAT BRITAIN won permanent possession of the Schneider cup. Flight Lieut. J. N. Boothman broke the record for the Schneider cup event, flying 217 miles at an average speed of 340.8 miles per hour. Flight Lieut. G. H. Stainforth traveled over the water at a much faster clip, establishing a new world's speed record of 379.1 miles per hour or about 6.4 miles per minute. This was the average speed for four laps, but in one of the laps Lieut. Stainforth reached a maximum of 404.2 miles per hour, thus passing the coveted 400-mile per hour mark by a good margin.

The previous world's seaplane speed record, made in 1929 by Squadron Leader A. H. Oriebar, was 357.77 miles per hour. The world's landplane record stands at 278.8 miles per hour, held by Adjutant Bonnet of France. Thus, we see that the new seaplane record is about 28.4 miles per hour faster than the best landplane record. There is no denying the wonderful performance of the seaplanes in the last of the Schneider contests.

America has won the Schneider trophy twice from the British. In 1923, Lieut. David Rittenhouse of the United States Navy won the trophy off Cowes, England. In the following year, no nation was prepared to contest the winner, and the United States graciously postponed the event for a year so as to give the other nations a chance to prepare. The American entry might just as well have flown around the course in America in 1924, and claimed the trophy just as the English did this year, but such was against our policy.

In 1925, the United States Navy entry, with Jimmy Doolittle at the controls, won again, and had the 1924 contest been postponed the United States would have come into the possession of the cup a good six years ago. The time made by the United States entry in 1925 was 232.57 miles per hour, which was 88.37 miles per hour faster than any other previous record.

It must be said that the seaplanes entered in the Schneider cup race are nothing but over-powered racing shells —practically all engine with a pair of wings sprouting out from the sides. They are not at all practical in a commercial sense and it is always a question as to whether such races really accomplish any good for the aviation industry at large.

As will be seen from the accompanying photograph, the Vickes-Supermarine-Rolls-Royce S. 6 B. is a distinctive type and of unusually slender proportions. Because of the tremendous weight of the engine and fuel, the pontoons are comparatively much larger than with the ordinary seaplane. The gasoline tanks form a unit with the pontoons, while the top surfaces of the pontoons are used as radiators. As the torques or twisting effort of the engine is about 500 pounds at the floats, this is counteracted by carrying considerably more fuel in the right hand pontoon.

Structurally, the ship is entirely of metal—mostly of duralumin and steel —with duralumin sheeting for the wing covering. The wing surfaces are also employed for dissipating heat from the

(*Continued on page* 62)

A Classy Ancient Transport Job

SINCE the earliest dawn of history, man's greatest ambition has been to emulate the birds and soar through the air on tireless wings. Daedalus and Icarus were the first to attempt a transoceanic flight, but the newsreel photographers failed to show up—apparently—and the duo made a notable failure. Icarus, who probably had been out on a binge the night before, began zooming too close to the sun, with the result his waxen wings were melted and he took a nosedive into the sea.

Many hundreds of years later, a youngster by the name of Darius Green invented a flying machine, but went into a tailspin to the detriment of his bones and a barn or two.

But, before Darius was bitten by the flying bug, there was a Brazilian priest who had it all worked out. This is of actual record as set down in the 56th issue of the *Evening Post*, a newspaper that was printed during the reign of good Queen Anne. This priest, one Father Bartholomew Laurent by name, described the "Flying Ship" minutely in this issue of the *Evening Post* and even went so far as to have a wood cut made of his idea for illustrating his story. The good Father Bartholomew describes his 10-place transport job and the reason for its invention as follows:

". . . he has found out an Invention, by the Help of which one may more speedily travel through the Air than any other Way either by Sea or Land, so that one may go 200 Miles in 24 Hours; send Orders and Conclusions of Councils to Generals, in a manner, as soon as they are determined in private Cabinets; which will be so much the more Advantageous to your Majesty, as your Dominions lie far remote from one another, and which for want of Councils cannot be maintained nor augmented in Revenues and Extent.

"Merchants may have their Merchandize, and send Letters and Packets more conveniently. Places besieged may be Supply'd with Necessaries and Succours. Moreover, we may transport out of such Places what we please, and the Enemy cannot hinder it:

"The Portuguese have Discovered unknown Countries bordering upon the Extremity of the Globe: And it will contribute to their greater Glory to be Authors of so Admirable a Machine, which so many nations have in vain attempted.

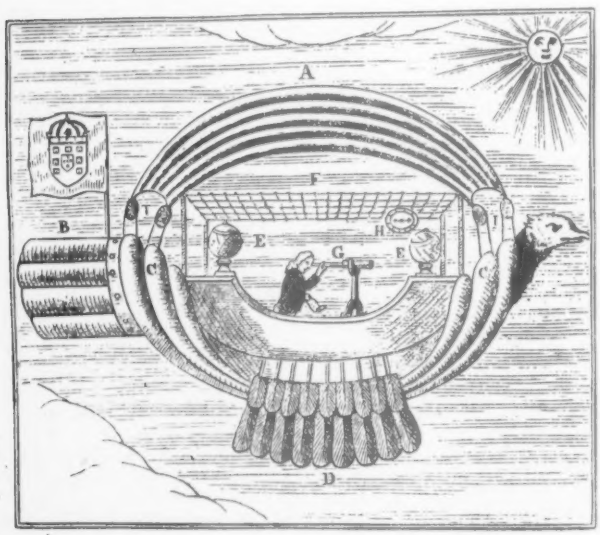
"Many misfortunes and Shipwrecks have happened for want of Maps, but by this Invention the Earth will be more exactly Measur'd than ever, besides many other Advantages worthy of your Majesty's Encouragement.

"But to prevent the many Disorders that may be occasioned by the Usefulness of this Machine, Care is to be taken that the Use and full Power over the same be committed to one Person only, to whom your Majesty will please give a strict Command, that whoever shall presume to transgress the Orders herein mentioned shall be Severely punished.

"May it please your Majesty to grant your humble Petitioner the Privilege that no Person shall presume to Use, or make this Ship, without the Express License of the Petitioner, and his Heirs, under the Penalty of the loss and Forfeiture of all his Lands and Goods, so that one-half of the same may belong to the Petitioner, and the other to the Informer."

Then followed for hundreds of words further dire penalties on the poor unfortunate trying to steal the inventor's idea. The document was, in a manner, a sort of patent protecting the inventor from all and sundry who might wish to get in the good graces of the king by "beating him to it."

(*Continued on page* 48)



Father Bartholomew's Aerial Fantasy in full operation, pilot in place and all going well—pictorially speaking. Note the range finder in use.

* *

And another big advance of the times, the feathered "pants" on the landing gear and the eagle beak spinner cap at the nose of the ship.

* *

And notice to our model builders. See the royal insignia so proudly floating above the tail group.

Warplanes of the Future

"WHAT will tomorrow's war plane look like?"

This is a question that thousands of imaginative aviation fans ask themselves as they read descriptions of the latest developments in military planes. In reply I shall attempt to bring out certain characteristics which I believe will be involved in the war plane of twenty years hence. I shall try to omit highly fantastic and improbable guesses, including only what in my opinion will be the logical development of present-day research.

Some ten years ago Lt. Col. H. E. Hartney outlined a plan for using small, low-powered planes of the sport type in warfare. These tiny machines, according to his idea, would not engage in air battles, but would skim low over the enemy, strafing them with machine-gun fire. These tactics, it is seen, are similar to those of the modern attack planes, but the diminutive planes would offer poorer targets than the larger ones.

By virtue of their small size, they would possess great maneuverability—another valuable asset. The planes, each equipped with a single light machine gun, would attack in large swarms. Being able to take off and land in a small space, they could follow up directly behind the infantry advance. No large aerodrome would be required, as with the usual pursuit squadron.

I mention Col. Hartney's proposal because I believe it deserves consideration, even after ten years. It is understood, of course, that such planes would not replace the regular air service, but would be considered merely as a unit of the infantry. Yes, infantry. In spite of your "wars in the air," there will always be a land army to occupy captured territory, bring up artillery and supplies, and to maintain control over the defeated nation.

But to get back to the small planes. The possibilities for their use as war machines are even greater today than ten years ago because of our lighter motors and methods of construction. Through quantity production they could be manufactured at a very low cost. They might be designed so they could be folded or dismantled quickly and concealed under ground.

In considering the mechanical features of such a plane, it is not unreasonble to believe that in the near future an engine will be developed—possibly of the air-cooled four-in-line type—delivering forty horsepower and weighing less than eighty pounds. The four-in-line type would offer a minimum of resistance and could be well streamlined.

The framework, and perhaps the covering material, might be some future metal alloy—extremely light and strong. The machine gun would per-

(*Continued on page* 46)

XUM

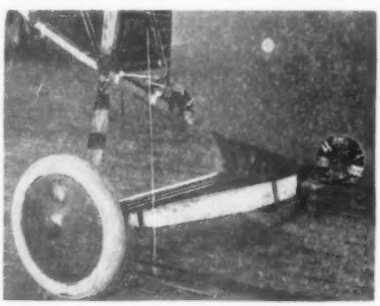
Taking Care of The Lightplane

by F. E. NOGLE

Methods of making adjustments and repairs on Lightplanes for the owner who prefers to do his own work

IF YOU are building or flying a light ship, the correct time to begin your safety crusade is in the inspection of the materials that you are putting into your ship. If you wish to continue in a good state of health, you will see that none but the best of raw material goes into it. This need not be brand new, but it must satisfy all requirements of good material for the purpose intended.

An inspection by a licensed mechanic or pilot, who know what they are



Inspect the landing gear wheels, axles and connections.

doing, is a help in assuring yourself that your plane is safe, or at least will hang together. Flight testing of your craft by a pilot used to strange planes is also good practice, for often the cause may not lie with the plane, but rather with the pilot.

Begin the inspection of your ship at the prop, and then work toward the rear. The following instructions should be followed for best results:

* * *

PROPELLER—Test for the condition of wood and finish. See that the bolts holding the prop to the hub are tight, and are properly safetied with either cotter pins or brass safety wire (iron or steel wire is liable to rust). See that the hub is tight on the shaft and that all bolts, keys or special retaining devices are in good condition. Prop should be tested as to "track" at least once every two weeks if the ship is flown frequently, or at least once a month if flown little. Allow no rust or deterioration of finish on either metal or wooden parts.

* * *

MOTOR—Regular motor inspection methods should be followed in this case. Generally, these include inspection of magnetos, oiling system, the engine controls, carburetor and gas lines, together with couplings or connections, ignition system, connecting wires and battery if any. The mounting bed, and the bolts holding down the motor to the bed, should be examined as to general appearance and the tightness of the mounting.

* * *

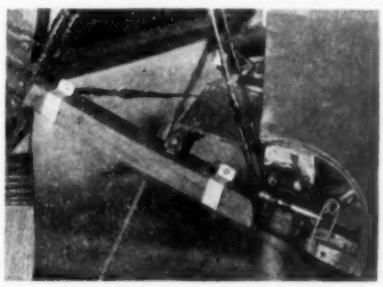
FABRIC—Fabric should be examined for tightness, and also should be examined for tears or chafes, particularly at such points as the wing tips where the ship is held while being turned on the ground, or where the ship has been lifted while being carried into the hangar. The paint job should be free from cracks which often occur at points where the fabric has vibrated from the air blast of the prop. Water leaks through such cracks and soon rots the fabric and underlying parts.

* * *

WOODWORK—As most of the wing structure of the light ship is of wood construction, it would be best to go into details on the matter of woodwork inspection. Where possible the inspection plates should be removed, and the woodwork given a thorough inspection at the following points—Strut fittings, drag brace fittings, attachment plates at fuselage, and condition of glue joints at all points where the woodwork is glued.

If possible, the spars and ribs should be checked for any cracks or splits due to a rough landing. In some ships the spars have a tendency to split at the under side of the fuselage attachment fittings, and if your ship is of this make, the spars should be checked at this point after every rough landing.

If you leave your ship out in the



Inspect all wing fittings and cables.

weather, and let the rain get at it, make sure no rain water is allowed to stand inside the wings. Water soon rots the woodwork.

Some ships are provided with eyelets at the trailing edge of the wings to allow this water to run off and it is a good idea to provide your ship with these if they are lacking. Any other woodwork on your ship should be inspected as to condition of finish and condition of the wood itself. The woodwork should always be protected with a good coat of either paint or varnish.

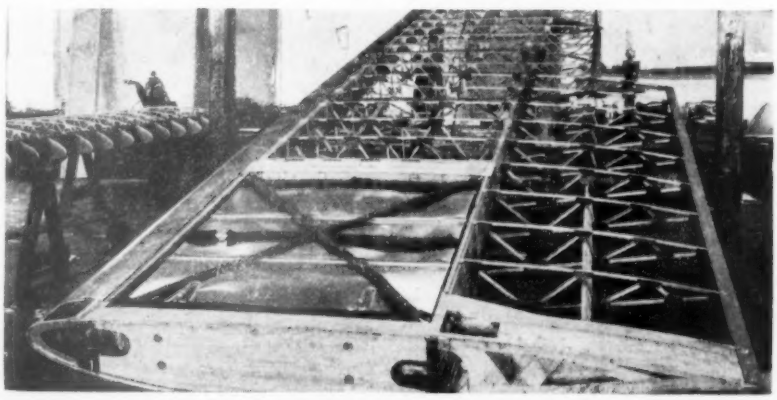
* * *

FITTINGS—The metal fittings on the ship should be free from all signs of rust or corrosion. All fittings should be scraped and painted where the least sign of rust or corrosion is present. Fittings should be inspected for cracks or any other sign of breakage.

This applies most strongly to the following fittings—Landing gear, wing attachment and strut or wire brace fittings, control fittings and horns, together with hinges and clevis pins. All other minor fittings should be gone over as to general condition, the main requirement being that they should be free from rust or cracks, and should be protected with a liberal coating of paint or varnish.

* * *

METALWORK—All metalwork on the lightplane, such as fuselage if of steel, steel struts, both wing and landing gear, steel control rods and all other metalwork is to be inspected for



The wing structure is complicated, and for proper inspection, covering should be removed.

cracks, rust and general condition of the members.

Attention should be paid to the landing gear struts and care should be taken to see that they have not been strained by rough landings or bent. Bent struts should always be replaced, for if they are straightened and then replaced they will nearly always bend again when placed under strain. All rusted parts should be painted as soon as possible.

* * *

CONTROLS AND CONTROL SURFACES—Control wires or cables should be gone over, and if found to be frayed or rusted, they should be immediately replaced with good cable, care being taken that the new cable is of the same size and length. Control surfaces should be firm and must not yield unduly when a twisting motion is imparted to them with the hands.

By this method, broken members in the rudders, flippers, etc. can be easily noticed and steps taken to repair the broken parts. Fabric should be taut and the finish in good condition. Care should be taken to see that no objects are in such a position as to impede the free working of the control surfaces, wires, the stick or rudder bar assemblies.

* * *

INSTRUMENTS—It is but natural that the best of care should be taken of the instruments in the plane, for they tell the pilot the condition of the motor, the altitude of the plane, its speed, its height, and numerous other facts all of which help toward the safe maneuvering of the plane. The instruments generally found on the lightplane of today consist of the following: Altimeter, or altitude gauge, Tachometer, or instrument that tells the number of revs the motor is turning over per minute, oil pressure gage and usually a gas gage and bank indicator.

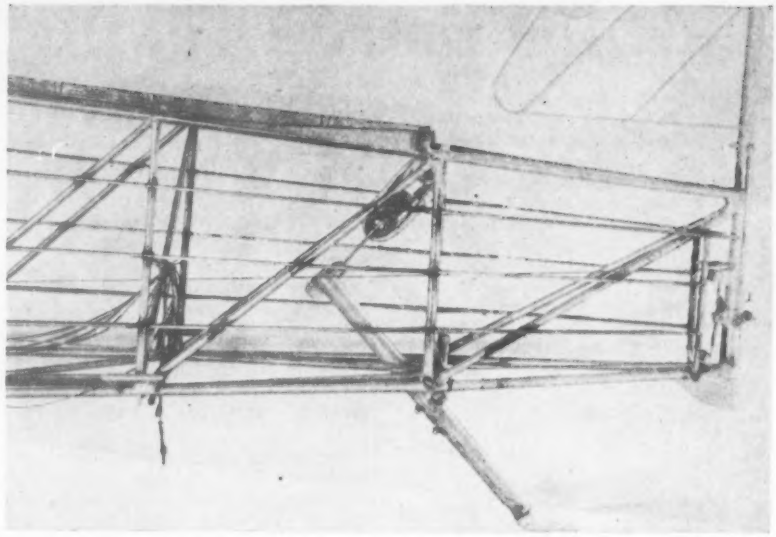
The instruments are generally built well enough so they are seldom in need of repair, but however, if anything should happen to cause them to be inaccurate, it is best to take the faulty instrument to a recognized instrument repair station. If you try to fix the instrument yourself, you will generally get into serious difficulty due to the complicated and delicate mechanism which makes up most instruments.

The best rule in regard to instrument repair is to "keep hands off" unless you are sure of what you are doing.

Inspection Before Each Flight

1. As it is best to organize some system, and always follow it in all cases of before flight inspection, the author suggests the following routine: Before each flight. Start with the prop, and work towards the rear of the ship in an anti-clockwise direction, around the right wing, tail assembly, left wing and then back to the prop again. The whole inspection should take not more than ten minutes before each flight.

2. First inspect the prop, test with hands for secureness by grasping each end and trying to wiggle back and forth. Inspect finish, condition of hub, and of mounting bolts, and secureness of spinner cap if your ship has one.



A view of a metal fuselage and its tail group members and connections.

3. Inspect secureness of cowling and motor exhaust stacks, on the right side as you face the front of the ship. Then, the center section struts on the same side, as to firmness, and condition of mounting bolts. Also the landing wire fittings and clevis pins. Now look over the flying wire fittings. See that their mounting is secure and that the clevis pins or bolts are safetied. See that there are no cracks or any other signs of fatigue of the fittings.

4. Now examine the wing struts on the right, together with their mountings, the flying and landing wire fittings. See that all bolts and clevis pins are safetied and are in good condition. Now examine the right aileron and the hinges. See that everything is secure and in good condition, that all pins and bolts are safetied, and the control cables or rods are O. K. See that the aileron moves freely and does not bind the least amount particularly at the trailing edge nearest the fuselage.

5. Now the tail surfaces should be examined, and care taken that they do not bind nor stick in any way. See that all control cables are secure and free from rust. Make sure all pins and bolts are safetied and that the hinges are mounted firm.

Wiggle all surfaces to make sure there are no broken members. See that all fabric is secure and free from tears or rips. Look over the skid and its mounting, satisfying yourself that all is O. K. Make sure the shock cord is not broken or loose.

6. The left wing struts, etc. should be examined in the same manner as the right. Before entering cockpit, inspect the fabric on the ship, and see that there are no rips, tears or holes.

7. While in the cockpit, and before starting the motor, see that all the controls work free and are unobstructed. See that the stick and rudder bar fittings are O. K. and that the throttle works easily and does not jam if moved suddenly back and forth. Make sure the safety belt is secure to its fastenings and the release buckle does its work in regard to opening quickly.

After you have inspected your ship in this manner, which should not take more than ten minutes at the most, you are ready to start your ship. The following precautions should always be taken in starting your ship.

1. See that the switch is off before turning the prop—be sure of this.
2. Have the wheels blocked securely, or have the brakes on if you have them.
3. Do not choke the motor too much, but first see that the gas is on.
4. Keep a safe distance from the prop when turning her over, do not try to hug it or bad results will be sure to follow.
5. Do not rev your motor up till the oil has become heated sufficiently.
6. Keep a safe distance from the prop when pulling the chocks, it is always best to have ropes on them so you do not have to approach too near. Have the ropes pointing away from the prop.
7. Always keep the stick away back when revving the motor up. Tie the belt around it and you will have no broken props.

Care of the Ship, for Each Part

1. CARE OF THE PROPELLER—The prop should be inspected regularly for any cracks or splinters caused by picking up cinders or pieces of rock. If the prop is cracked it should be discarded, but if a small splinter or two is the only trouble, the prop can be easily fixed. The splinter should be pried up just enough so some casein glue (mixed thin) can be poured behind it.

(*Continued on page* 53)

Ship Designed for Production

JOHN AFFLERBAUGH of Omaha, Nebr., has devised a sheet metal shell type construction which he believes will solve many of the troubles now experienced in the aviation world. By this means it is possible to more perfectly streamline the various parts of the ship, reducing the cost of operation and increasing the speed.

The construction consists of a sheet metal shell, so shaped that it becomes an effective beam without the necessity for external bracing or reinforcement. Wind tunnel tests on a full size wing have convinced the inventor that his theory is correct and he is now working on a four passenger cabin plane.

It is said that this design adapts itself to mass production for the various parts can be stamped to shape and then bolted together or welded by electricity. This gives a smooth homogenous skin, reducing the air resistance to a minimum. Although steel has been used exclusively, aluminum and aluminum alloys can also be employed successfully.

The new stamped steel ship in flight. From drawing.

Swiss Laws Are Strict

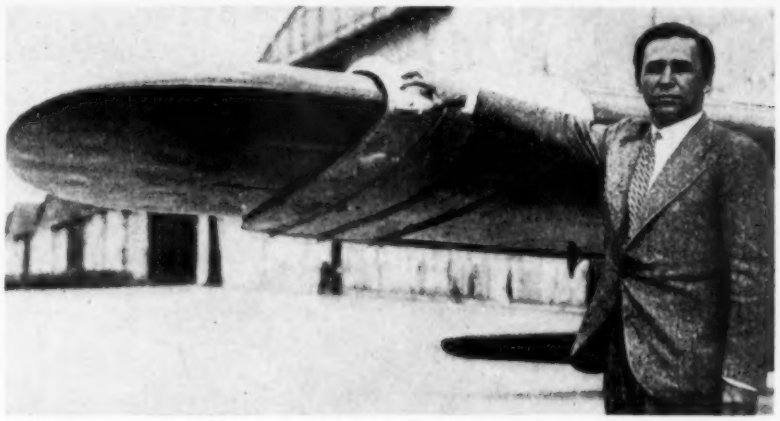
SWITZERLAND allows no violation of flying regulations, as was shown in the case of a foreign flyer, who recently finished his four months' prison sentence imposed as part of the penalty for violating three articles of the regulations for aircraft navigation over Swiss territory.

The flyer was found guilty of flying over Switzerland without a certificate of ability and without a license. Neither was he registered as a passenger. The last article violated states that aircraft arriving in Switzerland without the necessary authorization must land at designated landing fields and remain there until the necessary formalities are fulfilled.

This the flyer did not do as he operated from a private field in Switzerland. He did not announce himself to local officials and it was due to an accident to his plane that he was arrested.

In addition to the prison sentence a fine of $400 and one-third of trial costs were collected.

Extensible Wing Tip Gives Variable Area



Detail showing how wing tip slides in and out of wing.

IVAN MAKHONINE, Russian aviator living in Paris, has invented a new extensible wing plane. The wing can be pulled out nearly 50 per cent of its ordinary length, offering the advantages of being able to take off with a heavier load, decreased air resistance in flight, more speed and less gas consumption.

The wings measure 21 metres and may be contracted to 11 metres by a central axis which pushes out and draws in the wings.

Airport Circling Rule

THE circling of an airport to the left (counterclockwise) has been the general practice at the majority of airports throughout the United States. This method, recommended by the Aeronautics Branch of the Department of Commerce, will become an amendment to the Air Traffic Rules effective December 1, 1931. Where local wind or other conditions require circles to the right, or right or left circles at different times, it will be necessary for those airports to provide for such turns by displaying suitable markings.

If clockwise (right turns) are to be made at all times, the letter "R" shall be displayed in the center of the landing area marker circle and, for night operation, the letter "R" shall also be displayed.

If left-hand and right-hand turns are to be made at different times, depending upon wind conditions, the letter "X" shall be displayed in the center of the circle marker. The letters "R" and "L" shall also be placed upon the roof of an outstanding airport building, or on other suitable area, and shall be so arranged that either the "R" or the "L" may be displayed, depending upon the direction of the turn. Further details as to the type and color of lettering may be obtained from the Aeronautics Branch.

Flying in Cloud Banks

NEW regulations to make flying safer on America's passenger air lines have been adopted. Flying of transport planes over stretches of fog and clouds without two-way radio equipment is prohibited. The pilot now has an eight-hour day and 30-hour week, and trips where destinations are landing fields on which the fog or cloud ceiling is lower than 300 feet, are prohibited. The U. S. Commerce Department has obtained the approval of 30 air line operators to the agreement.

Fouls Glider in Trees

SIDNEY CARLSON, intrepid fourteen-year-old glider pilot, was willing to give the fourth-of-July crowd a thrill at Seacliff, Long Island. He took off from a convenient hill, but when the breeze freshened and started

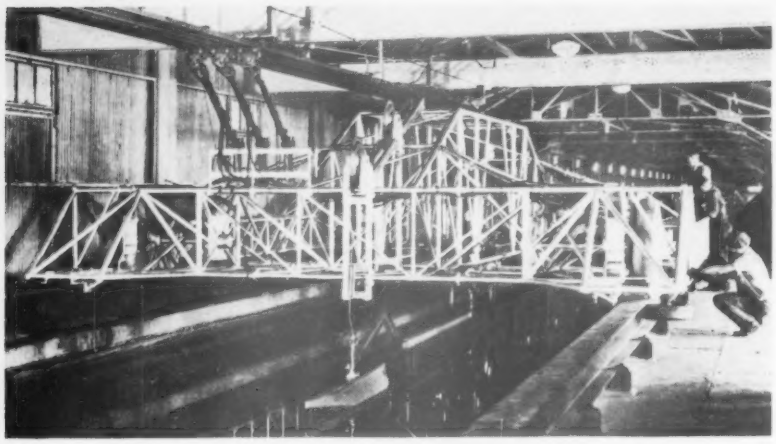
Here he is, among the trees.

to take the glider up, the amateur pilot decided it was time to land.

Unfortunately, he got all tangled up in some telegraph wires from which he was rescued by firemen.

As shown, Sidney's glider is hanging by its nose in a creepy position. However, he was not injured.

Testing Seaplane Hulls at the Naval Laboratory



Towing the model hulls through the basin.

THIS seaplane towing channel, constructed for the United States Navy, is for determining the water resistance of seaplane hulls of various types. It is entirely enclosed in a long narrow shed, permitting tests to be conducted regardless of weather conditions and in strict privacy. Its length is 2,040 feet and in depth it varies from 3 to 12 feet.

The model to be tested is suspended from a steel arm under the skeleton-like carriage and rests upon the surface of the water within the long tank. The carriage, deriving its motive power from electric motors, moves ahead at varying speeds, drawing the model of the hull along with it.

One operator rides the car with the model of the seaplane, and a dial at his hand records the resistance at different speeds. It is located at Langley Field and is the largest seaplane testing channel in the world.

A Good Joke on Steele

A GLORIFIED garbage can, designated as the "Dodo Prize," rests upon the desk of Dudley Steele at Los Angeles. It was presented to the flyer in commemoration of a one man aerial show which he put on recently over the Los Angeles Municipal Airport. The "cup" bears the inscription, "Winner of the speed diving contest at Los Angeles Municipal Airport." Near the cup rests a giant dumbbell, a scroll and a tin medal—additional trophies presented to Steele by his fellow flyers.

Recently, while flying over the airport, Steele made a series of power drives at a 200 mile an hour clip over the office of Col. Richard Barnitz by way of greeting. On landing he was greeted, not by Barnitz, but by a Department of Commerce inspector for the Aeronautics Branch, who cited him for the spontaneous burst of speed.

He was later given a Departmental hearing and fined fifty dollars. Several days later he was called to an important luncheon conference at the airport, where on arrival he found thirteen brother flyers awaiting him. The prizes were awarded him, with the designation of "Dodo Prize Winner," to remind him that there are places for power dives—one of them *not* being over an airport. Steele also paid the bill for the luncheon.

Mosquito Gets Into Trouble

A MOSQUITO that lived and died in Russia in 1910 played an important part in aircraft development, it has just been brought out at the Sikorsky factory at Bridgeport, Conn.

Igor Sikorsky was a young man of 27 in that year, and he had just built himself an airplane, after he had abandoned experimenting with the helicopter. On its thirteenth hop the engine of the airplane died in mid-air and the ship crashed.

After Sikorsky had crawled unhurt from the wreckage, he took the motor, or what was left of it, to pieces, determined to find out what had caused the accident. He blew through the gasoline line and out came a very dead mosquito.

"Planes will never be safe," Sikorsky decided, "so long as so feeble a thing as a mosquito can destroy the power plant. Evidently what must be done is to have more than one engine so that when the need arises they can be divided, one for the mosquito and one for the plane."

And so Sikorsky designed a multi-motored plane, the development of which stamped him as one of the world's greatest aeronautical designers. But Sikorsky always paid due tribute to that big Russian mosquito which, as it turned out, gave its life for the advancement of science.

A Transpacific Airport in Japan

THE Japanese Ministry of Air is so confident that transpacific flying will speedily develop that it is now busily engaged in establishing an air customs office at the new international airport at Haneda. This town lies about halfway between Tokyo and Yokohama. Construction on this new port was started in 1921, and it is now rapidly nearing completion. It will be opened by an official ceremony in October, and will then be ready for air traffic.

Because of the dense population, the Japanese Ministry of Air has always experienced great difficulty in finding level areas near the large cities. They have solved this problem at Haneda by reclaiming land from the sea. This new airport covers 130 acres, of which about 50 are paved and eight more are covered with turf. Because of Japan's annual rainy season a paved runway is essential. One of the features of the airfield is a river emptying into the ocean, which officials have equipped with a landing stage for seaplanes

Weather Conditions Given Serious Study

Sounding balloons ascending.

PHOTO shows a scientist watching the course of a Pilot balloon. Filled with hydrogen gas, this rubber balloon bursts when it gets up too high and the height is recorded.

Airports all over Europe are supplied with weather reports from the great Lindenburg Observatory near Berlin. Observation kites and balloons go aloft with delicate instruments for recording atmospheric data.

XUM

Instruments vs. the Senses in Flying

By J. B. STEPHENS

When surrounding objects are obscured by fog or clouds it is no longer safe to trust the judgement of the pilot. Under such conditions the instruments must be relied on.

SUPPOSE you are offered a free trip on an airliner from Los Angeles to New York and return. You also have your choice of two pilots, one of them a veteran flier in the world war with several thousand hours flying time behind him, but with no schooling at a modern aviation institution. The other, a younger man we'll say, is a recent graduate of a reputable air college with only his required minimum flying hours for a transport license.

Given these factors, the average American would choose the veteran aviator, probably without hesitating to consider numerous other vital points which enter into any argument as to the dependability and efficiency of our present aerial passenger traffic.

It is conservatively estimated that 90 per cent of all airplane mishaps occur through human fallibility. The other 10 per cent result from structural weakness which may bring a ship to earth, but seldom causes death or serious injury.

Therefore, if our pilots are well-trained, this high percentage cause of all accidents would be reduced materially. This line of thought reverts to the choice between the experienced pilot of many hours flying time and the younger aviator just out of school.

Major Ross McBride, dean of the Hancock Foundation College of Aeronautics at Santa Maria, California, was asked which pilot he would select. "I'd take the younger one," he replied without a minute's hesitation.

Queried as to the "why" of his choice, it developed that he'd take the comparative newcomer to aviation circles "if," and it was a pretty big "if," the pilot had been trained in blind flying.

Blind flying, for the uninitiated, is the process of steering a plane without being able to see two feet in any direction. It's like walking in a cactus garden on a pitch-black night with only one clear path out. Fog, rain, snow, sleet, and darkness constitute the figurative cactus prongs ready to puncture any minute—usually with fatal consequences if they strike at all.

As a sea captain depends on his navigating instruments, so must a transport pilot or any other person at the controls of a plane, guide himself out of the maze. But instead of a lone compass with which the seaman can chart his way to safety, the airplane pilot must depend upon and be familiar with at least half a dozen other weapons to win his freedom from the "cactus garden" of a lashing storm or dense fog.

Among them are: 1—Bank and turn indicator; 2—Pitch indicator; 3—Altimeter; 4—Rate of climb indicator; 5—Air speedometer; 6—Tachometer.

Of course, there are any number of other instruments from oil and gasoline gauges to radio sets, but those listed above are the most important to the transport pilot with whom human life is placed as he drives his giant vehicle through the skies.

It is easy for anyone to learn the names of these impressive looking cowl decorations, but to use them and to use them intelligently is another matter.

For this last reason, the United States Army finds out whether its pilots are "instrument fliers" long before a plane is entrusted to them. If you can read your instruments correctly, and BELIEVE WHAT THEY SAY although your sense tell you they're wrong, then you'll qualify as an army pilot. To ascertain whether or not candidates for the army air corps belong in the latter category, rigid "blind flying" tests are conducted before the prospective flier ever gets into the cockpit of a ship.

The essential difference between an instrument flier and a "horse sense flier" depends on exactly what they do when piloting a plane or are experiencing the same sensations that a plane might offer in relation to the instrument board. If the "sense" of a pilot tells him he's turning right, and the instrument says he's going left, he'd better trust the instrument.

Proof of the "why" of this will be offered later. If he's been well-trained in instrument flying, he *will* always turn the way his instrument indicates. That's why Major McBride and other knowing fliers would rather fly with a man who trusts to his dials.

Here is a simple experiment to prove it.

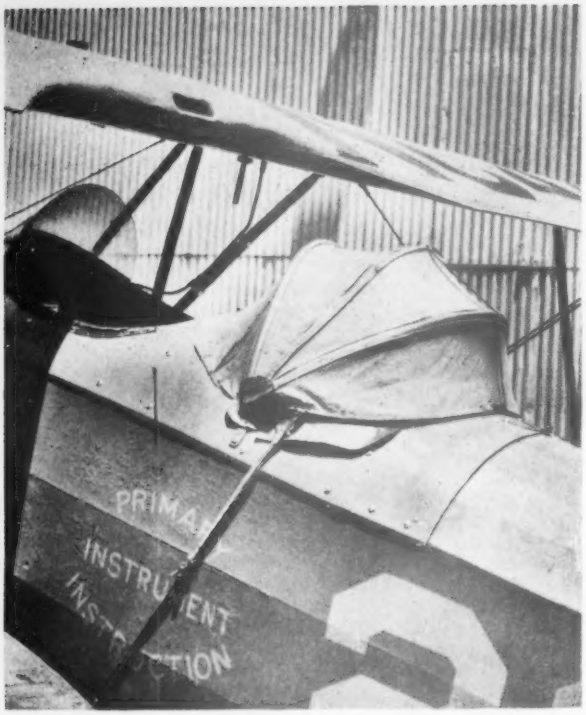
Sit in a swivel chair, either blindfolded or with your eyes closed tightly, elbows on knees and the torso slightly bent forward. This is the body position when in the cockpit of an airplane. Next have a friend turn the chair in either direction slowly when he walks around with it. So long as he continues to move you in the same direction at a moderate speed, you will be fully aware that you are traveling—let us say, to the right.

However, when he slows down this circular movement to half speed, your mind immediately will register "left," although you still are traveling right. Even if he brings you to a complete stop, you will feel yourself turning to the left for some time afterwards.

Imagine yourself piloting an airplane in a blinding storm or in an impenetrable fog. What would happen if conditions necessitated your moving the "stick" for a right turn and you would shove it left? Already in a spin to the left, perhaps, you throw the plane into a still more violent twist in that direction. The answer arrives before you know what struck you—an exceedingly hard smash on the ground beneath or into the mountainside.

To demonstrate exactly what hap-

An unusually complete instrument board on the latest Lindbergh ship. It is by the use of these instruments that the pilot can fly without landmarks in dense fog.



Training plane specially fitted for blind flying instruction and for instrumental flying.

This ship is fitted with a folding hood over the rear cockpit so that the student or pilot cannot see where he is going and must therefore depend upon his instruments.

This special rig was devised by and is being used by a well known aeronautical school and is advocated by the author.

pened in the labrynth of your ear while you were turning round and round in the chair, try this experiment: Take a tumbler of water and place a burnt match in it. Put the tumbler as near the exact center of the chair's seat as possible and start the chair circling just as it did when you were sitting in it.

The chair, glass, water and match all are traveling in identical direction. Now, slow down the chair's movement as before, watching the match and water continue to travel at the former speed. The latter two are moving in the same direction as the chair but at a faster gait. This is what happens inside your skull. The fluid in your ear's semi-circular canals move like the water, and the effect registered on your mind is that of reversed direction.

Not convinced yet? All right. They'll tell you to come out on the field so that they can show you something else that will prove "horse sense" isn't always so dependable. The blindfold will be replaced after you are shown an objective some 1,700 paces distant. "Walk in as straight a line as possible to that fence" are your instructions.

Starting out bravely and confidently, as most of us would, you are followed by another cadet carrying a sack of lime which he sprinkles on the ground behind you as you walk. Your mark is indisputably made thereby, and you have no recourse to charges of trickery when the blindfold is removed after your 1,700 paces are completed and when you find yourself in the center of an almost perfect spiral of a lime trail.

While you thought you were walking in a bee line for the fence, you curved off right or left and executed as nice a spiral as any airplane might cut in the air. Oftentimes, the subject will circle around behind the starting point, while others go off by themselves some hundreds of yards from the desired objective where they spiral to their hearts' content.

Finally convinced, that perhaps his common sense is wavering and that his judgment isn't exactly what it used to be, the student is introduced to his first instrument test. It is presumed, of course, that he has had preliminary ground school training and dual control flights of sufficient length to warrant his taking charge of the plane while in the air.

The instructor bundles his student into a specially built cockpit, covered entirely by canvas or some similar material. All the student is able to see is his instrument board and by this alone must he guide the ship. On arriving in a fog bank, after a maneuver calculated to confuse the aforementioned "horse sense," the instructor suddenly snaps the catch off the cockpit covering and the student finds himself "flying blind" in actual fact.

If he's made up like the average human being, his uncertainty is multiplied by the factor of fear. In spite of his four or five hours of instrument flying training he now plunges into a spin, forgetting all about bank-and-turn, pitch indicators and rate-of-climb gadgets.

On coming out of the cloud bank or fog, he is usually able to correct his

(*Continued on page* 55)

Planting Rice by Airplane Insures Big Crops

PLANTING of rice by airplane is one of the latest labor-saving innovations to find favor in California. The leading exponents of this highly modernized way of sowing rice are the owners of the Hughes and Johnson ranch that covers several thousand acres in the vicinity of Sacramento. Two planes, operating under average conditions, can sow from 500 to 600 acres a day. Recently, however, two planes sowed 900 acres in one day. The cost per acre is considerably under that of other methods.

Planes used for this purpose carry seven sacks of grain on each trip. This is put in the front cockpit which is lined with canvas. Two four-inch shutters at the bottom of the pit are manipulated by the pilot. In sowing the rice, the planes are flown 20 to 25 feet above the ground at a high rate of speed, covering a width of approximately 30 feet at one time.

Preparatory to sowing rice from the air, the land is flooded with from 10 to 15 inches of water which is kept circulating by a large pump to maintain a fresh flow of water on the land at all times. By sowing the rice in the water it matures from ten days to two weeks quicker than it does otherwise and prevents the birds, ducks and mud hens from eating the grain as it is planted.

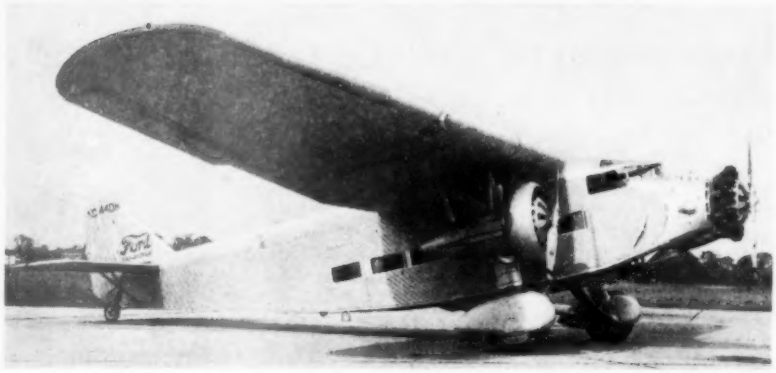
A Combined Airplane and Dirigible

Nicholson holding model of his invention.

A NOVEL combination of dirigible and airplane has been developed by Henry A. Nicholson, who has recently put a small model of his invention on display. The Nicholson ship is practically all wing, inside of which the helium tanks will supplement the action of four propellers as a lifting force.

The propellers are of a new cone shaped screw principle, which the inventor claims will produce a sixth more power than the type now in use.

A Luxuriously Outfitted Ford Trimotor Ship



Special Ford Trimotor shipped to England.

A FORD trimotor club plane has just been shipped from Boston to Manchester, England, for display by the pilots of the Ford Motor Company, Ltd., in Great Britain and on the Continent.

The club interior of the plane is finished in rich browns, greens and tans, the lower wall panels being of oriental walnut, with a decorative frieze of English hunting scenes against a tan-colored background. Walnut panels between the windows are set off with a riding crop and horn against a similar background.

The six club-type reclining chairs, and a divan accommodating three persons, are upholstered in grain leather. Other interior fittings include an electric fan and a cupboard built into the forward wall of the luggage compartment which is located just to the rear of the passenger compartment. A lavatory, fully equipped, is reached by a door opening out of the cabin, adjoining the luggage space.

The plane is of the high speed type, with high wing which allows full head room throughout the cabin. Each of the three Wasp engines is fitted with an electric inertia starter. Other equipment includes an aperiodic compass. Compartments are installed in the wings for carrying 1,600 pounds of luggage. The plane has large auxiliary gasoline tanks to permit long aerial tours.

Interior of Ford Trimotor.

Physical Condition of Pilot Found Most Important

LICENSED airplane pilots, who are physically normal, have achieved safety records approximately fifty per cent better than those of pilots with physical defects, according to the Assistant Secretary of Commerce for Aeronautics. This is the result of a study of the effect of physical qualifications upon activities of licensed pilots just completed by the Medical Section of the Aeronautics Branch.

The study also dealt with student flyers, and showed that in this group the percentage of physically normal persons who complete their flying instruction and qualify for licenses is twice as great as the percentage of successful students among those having physical defects.

The physical defects concerned in this study would hardly be regarded as serious in most walks of life. The standards of the Aeronautics Branch in this regard are necessarily high, and a prospective pilot is unable to pass the medical examination if he is decidedly subnormal physically. And yet, this study shows us that those with defects not serious enough to disqualify them for licenses nevertheless are handicapped.

For example. Among the 4,227 airplane accidents analyzed in connection with activities of licensed pilots, 83 per cent involved physically normal pilots and 17 per cent occurred to those with physical defects. However, 88 per cent of all licensed pilots are physically normal and only 12 per cent have defects. In other words, the physically defective group contributed more than 40 per cent more accidents than would be expected on the basis of the numerical ratio between the two groups.

Airplanes Now Used Instead of Kites

IN KEEPING with the trends of modern times, the United States Weather Bureau is preparing to do away with its kites in favor of airplanes. For more than 30 years the Weather Bureau used specially constructed kites to explore the upper air, but plans are now being made to collect weather data by aerial flights.

One reason given by weather officials for making the change is the growing danger of airplanes colliding with the powerful kite wires. Although the bureau has only five kite stations, and numerous warnings have been issued to aviators to avoid the localities of these stations, officials feel that this hazard should be removed.

A specially designed aerial meteorograph has been built by the Weather Bureau for test flights. It is built on the same principle as the instruments used with kites, but is stronger and equipped with straps by which it is fastened to the wing struts. Officials feel that the cost of obtaining weather data by airplane will be no greater than the amount now spent for kite stations.

In addition, airplanes can fly on many more days in the year than it is possible to fly kites, so it is probable that more complete records may result from the use of planes for collecting weather data. The only difference in the information secured by the two methods is that the instrument designed for planes records only temperature, air pressure and humidity, while the old instrument recorded wind velocity in addition.

German Glider Champion Makes Long Flights

German champion in his glider.

HERR KRONFLED, well known German flyer, is shown in the cockpit of his glider. He crossed the English Channel from England to France, and then from France to England, winning a thousand pounds offered by an English newspaper for the feat.

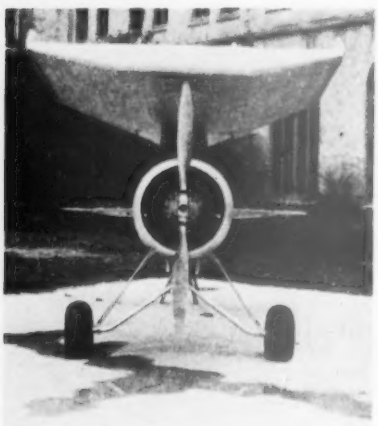
A Plane That Is Sucked Up in the Air

by O. WESTCOTT YOUNG

An interesting study of an airplane that is based on entirely new principles and flies. This ship is shown on the cover of this issue.

NOT LONG ago Louis Bleriot said that the most important need of aviation "is increased safety, and that a way must be found to cause the airplane's wings themselves to act as a parachute—or to construct wings which will make it possible for a plane to descend in the manner of La Cierva's autogiro."

In the last two years, the autogiro has been the only machine introduced which has demonstrated its ability to



Front view showing short span of lifting cellule.

do the very thing which Bleriot has urged, but the keynote of its success has been the swirling rotor over the pilot's head—a direct mechanical process.

But today, such a plane as foreseen by this famous pioneer has been constructed and flown by the University of Miami in Coral Gables, Florida. Called the "Vacuplane," it represents two years of experimental work carried on by Edward H. Lanier of Covington, Ky., and its construction is radical in view of the fact that the plane is without wings, in the ordinary sense. It depends entirely upon a high lift cellule for flight which in turn acts as a parachute in descent.

Long before Bleriot urged the need of safety Mr. Lanier had perfected a machine to manufacture ice cream cones. When he found himself free to undertake a hobby he turned to airplanes. Back of his decision was the belief that a new type of lifting surface for airplanes could be designed. A type which would have greater lifting power, close to and over the cabin and fuselage. This would prevent diving or slipping and would climb or descend almost vertically without utilizing a moving mechanical device as with the autogiro.

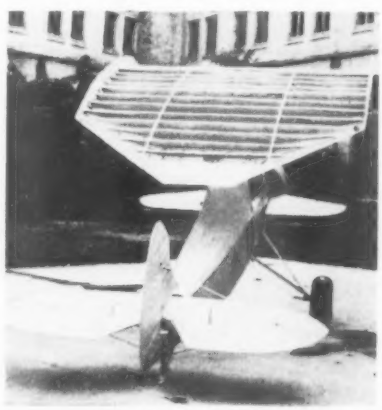
In Cincinnati, 1930, the XL-2 experimental plane made its appearance. The plane introduced a new theory of lift and self-balancing force. A hollow wing or cellule was employed with an open top to create an area of low pressure in and above the cellule. The lift was located along the front half of the fuselage, well forward above the engine, and laterally over the air channels at the highest point over the load.

At the Lunken airport this experimental plane developed several important characteristics; namely, that of exceptionally great lift and a self-balancing force at any speed. An exceptional retarding effect in a nearly verticle descent performed the function of a parachute; that is, lifted more than one-half the gross weight of the plane above the center of gravity.

Beneath the cellule lift, Mr. Lanier attached wings that were separated from the body. Theoretically, the inventor claimed, the cellule with 98 square feet of open top surface at 40 miles an hour was lifting between nine and ten pounds per square foot. With 131 square feet of effective surface of two degrees angle of incidence, they were lifting only 3.7 pounds per square foot. But the skepties at the airport just smiled.

The plane went aloft—not once but forty times. Pilots reported that no ship built at that time had the ability to settle from a considerable altitude with so little forward speed. At 200 feet, with the engine throttled to a slow idle, the ship pancaked the full distance and injured nothing. It was under control at all times and landed with a forward speed of under 20 miles an hour.

Pilots also proved that the XL-2, when skidded or slipped, automatically assumed an even keel and maintained stable flight. At an altitude of 2,500 feet, the ship was started into a steep dive with the power off. After reaching a limiting speed it did not further increase. The nose of the ship showed no tendency to drop into steeper dive, but instead, the ship righted itself on



Showing cellular construction of lifting surfaces.

an even keel and pancaked to earth—safely.

The inventor was satisfied that the cellule lift made a ship inherently safe and "foolproof," but despite the tests, aviation experts contended that the small wings were doing the trick and not the cellule. So Mr. Lanier packed

(*Continued on page* 50)

The ship complete and ready to fly—a three-quarter view. The short span permits of storage in small quarters.

* *

This design adapts itself well to cantilever construction because of the short cell.

Question and Answer Department

THIS department continues its popularity, and as we have before mentioned, is at the service of our readers who may wish to gain information on matters pertaining to aviation. However, we must remind them that the scope of the department is limited to aircraft construction, operation, maintenance and elementary theory, and that our staff cannot undertake the analysis of inventions nor give advice on patents.

Just a word to those who have sent in questions that have not yet appeared in this department. We receive so many letters each day that it is sometimes impossible to answer all of them in one issue, but have patience—they will all appear in the order received. Of course, we reserve the right to determine whether a question is suitable for printing in these columns, and again, we cannot undertake the answer of a question that involves much technical research.

We, however, solicit questions under the conditions named, and thank our many readers who have taken such an interest in this matter and who have sent in so many good legitimate questions in the past. Address all letters to the Question and Answer Department, POPULAR AVIATION, 608 S. Dearborn St., Chicago, Ill.

* * *

QUESTION:—Henry Bancke, Rochelle, N. Y. *Is the Autogiro as efficient and as fast as an airplane?*

Answer:—MORE power is required for the propulsion of the Autogiro than for an airplane—speed for speed. Thus, with a 300 h.p. engine, the Autogiro has a speed of about 100 m.p.h., while the same size engine on an airplane would bring the speed to about 180 m.p.h. or higher. Whether this will always be the condition, it is difficult to say, but seems likely that at least some further improvement is possible.

* * *

QUESTION:—Sam Brunner, Ramona, Kas. *What is the action of a flat spin? How do you recover from a spin? Do all planes recover from a spin in the same way?*

Answer:—A FLAT spin in the result of centrifugal forces that exceed the side surface resistance of the ship, and from a practical operating standpoint, is largely due to incorrect banking on turns. Generally, recovery can be had quickly by slightly nosing the ship down, banking up against the spin and at the same time giving it the correct amount of opposite rudder. Not all ships act exactly the same under such conditions, because of different relative distribution of side areas, but this is a matter of degree rather than of any differences in principle.

* * *

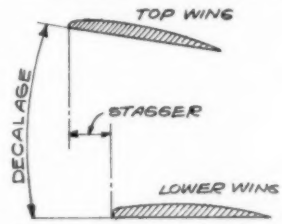
QUESTION:—Harry Lewis, Cleveland, Ohio. *I will appreciate any assistance that you can give me through your "Question and Answer Department" that will help me build a lightplane. The first question concerns the adjustment of staggered wings.*

How would you place wings with a positive stagger on a lightplane?

Is it necessary to have a dihedral angle on at least one wing of a biplane?

All questions of general interest on any phase of aviation will be answered authoritatively by Popular Aviation's Technical Staff.

Answer:—THE amount of stagger to use for the usual type of biplane is from 1/5 to ¼ the chord, that is, if the chord of the wing is 24 inches, then the stagger should

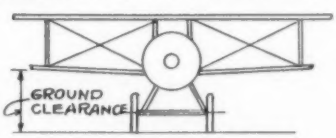


Showing Stagger and Decalage.

average 6 inches. This improves the efficiency of the surfaces and improves the longitudinal stability. In fact, if decalage is also employed in combination with the stagger, the ship can be made almost automatically stable in a longitudinal direction.

Decalage is the difference between the angle of incidence of the top and bottom wings. Thus, if the top wing is set at an angle of 4° and the lower wing is set at 1°, then we have a positive decalage of: 4—1=3°. In general, there should be a decalage of from 2° to 6°.

Dihedral angle is not necessary in



Reason for low dihedral.

either wing for a lightplane operating at ordinary speeds, and is not even desirable in most cases. The dihedral angle increases the drag and power, and there may be times when it disturbs the stability rather than improves it. However, the lower wings are frequently given a dihedral angle simply for the purpose of increasing the ground clearance at the wing tips, the top wing being perfectly straight and flat.

QUESTION:—Betty Horn, Iowa City, Ia. *Please tell me the formula of high-test gasoline, and also explain if the hydrogen in it furnishes all of the power.* (2) *If an engine were supplied with pure oxygen, would it give more power? If not, what would it do?* (3) *What would be the advantage?* (4) *Would it be advisable to build a flivver plane of the pterodactyl type?*

Answer:—GASOLINE is a hydrocarbon containing carbon and hydrogen in varying quantity. Gasoline is made up of a great many different simple hydrocarbon compounds of this nature, some having high boiling points while the boiling point of others is so low that they will boil violently at ordinary room temperature when isolated. The hydrocarbon compounds most nearly representing high test gasoline are Hexane (C_6H_{14}) and octane represented by (C_8H_{18}). The relation is such that the lighter hydrocarbon bodies give more power per pound while the heavier ones give more power per gallon. For this reason, a gasoline having a predominating light constituent is the lightest per horsepower.

The carbon element supplies the greater part of the power. Hydrogen is "endothermic," that is, consumes power within itself when burning, and therefore delivers less than its theoretical heat to the engine. An engine supplid with hydrogen as a fuel is very inefficient when hydrogen is used alone.

(2) The use of oxygen would increase the power slightly by insuring the complete combustion of gases that would otherwise pass out of the exhaust when air was used, and there would also be an increase due to the fact that the nitrogen in the air absorbs heat and carries it out through the exhaust. However, oxygen would permit a greater amount of gasoline to be burned per stroke than with air, and for this reason we could expect a considerable increase in the power with oxygen.

(3) Use of oxygen, if practical, would decrease weight of engine.

(4) To build a flivver plane of the pterodactyl type would require a considerable amount of experimenting, but it is possible that this type would prove practical because of the reduced length.

* * *

QUESTION:—George F. Frazier, Cambridge, Mass. *There are two subjects in the September issue which I would like to have more information on. First, I would like to have the name of the German company producing the single place monoplane selling for $225. Second, I would like to get in touch with Mr. Wilson Hammond of Montreal to get some of his dope on the Heath Parasol.*

Answer:—THE German plane illustrated on page 23 of the September issue is about to be put into production by a labor organization

of Berlin, Germany. This is a sort of cooperative arrangement for the utilization of the unemployed. As soon as we have more information on the subject we will be glad to publish the facts to our many readers who have asked this same question.

Paging Mr. Wilson Hammond of Montreal!

* * *

QUESTION:—A. G. L., Muskegon, Mich. *What is the difference between "brake - horsepower" and "nominal*

Pterodactyl type wing.

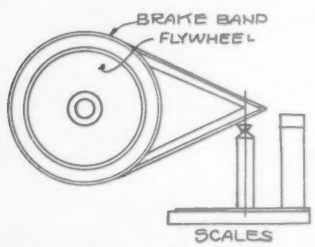
horsepower"? I have seen these terms used and wish to understand where the difference lies.

Answer:—THE nominal horsepower of an engine is its rated horsepower, or more generally, the horsepower at which the engine gives the best performance. The brake-horsepower is the actual horsepower developed and measured by a brake or dynamometer. In the case of an aeronautic engine of the internal combustion type, the nominal horsepower is the horsepower at which the gasoline economy is the best, the engine actually being able to develop a considerable amount over the rating or nominal horsepower.

* * *

QUESTION: — Fred O. White, St. Louis, Mo. *Why is the overhead valve used in aeronautic engine design instead of the "L" head so commonly used with automobile engines? As a matter of fact, I don't think that I ever saw an aeronautic engine of the "L" head type.*

Answer:—THE compression ratios in an aeronautic engine are so much higher than with the automobile engine that the small clearance space makes overhead valves a necessity under present conditions.



Prong brake for testing horsepower.

Again, the use of overhead valves, without the side pockets of the "L" head type, are more economical. There is less jacketed wall surface for a given cubic displacement, hence heat is not conducted away from the burning gases as rapidly.

* * *

QUESTION: — Gertrude Alberta, Milwaukee, Wis. *What is the center of pressure and how does the center of pressure movement disturb the equilibrium of an airplane?*

Answer:—THE center of pressure of the wing, located between the leading and trailing edges, is the point at which all of the pressures on that section are supposed to act. If the air pressure were distributed uniformly all over the wing surface, which it is not, then the center of pressure at which the surface would balance would be located midway of the leading and trailing edges.

For the reason that the pressures on the forward portions of the wing are greater than those located further back, the center of pressure of an airplane is nearer the forward edge and in front of the center with the wing set at a normal angel of attack. When the angle of attack is increased or diminished, the center of pressure changes its position, the amount of movement depending upon the characteristics of that particular wing section.

Since the lifting force is assumed as being concentrated at the center of pressure, it is obvious that any change in the position of this point will disturb the fore-and-aft equilibrium of the ship. In effect, it is just the same as though the entire weight of the ship were suspended by a string attached at the center of pressure.

* * *

QUESTION: — Gala Hubbard, Star, Calif. *Can ordinary automobile engine oil be used successfully with an aeronautic engine? If not, why are the grades different?*

Answer:—THE lubricating oils used in aeronautic engines are very much thicker or more viscuous than those used in the automobile engines for the reason that the operating temperatures and compression of the aeronautic type are very much higher than with automobile engines. The common automobile oils would thin down to such an extent that they would be practically useless under the terrific bombardment encountered in the aero engine. Where air-cooling is employed instead of water-cooling, as is the case with radial type aero engines, then the conditions are just that much more severe.

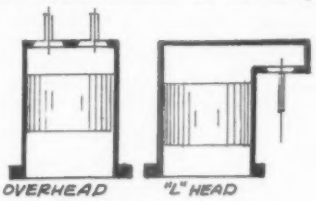
* * *

QUESTION:—Fred R. Rice, Benton Harbor, Mich. *Why is a helicopter different than the Autogiro? So far as I can see, they are identical, except, perhaps, for the flexing blades and other changes in minor details.*

Answer:—THE lifting propellers or screws of the typical helicopter are driven directly by the engine or else through the medium of belts or gearing. The lifting screw or "rotor" of the Autogiro is driven by the air stream and is free from any direct connection with the engine whatever. In both cases, however, the weight is lifted by the reaction of revolving blades so that the matter sums itself up into a difference in the mode of applying power. In addition, the flexing or distortion of the blades and arms affect stabilization and overcome the older overturning moment experienced with the older types of helicopters.

* * *

QUESTION:—H. R. Eagles, Denver, Colo. *Can an airplane with fixed wings ever be devised that will lift as quickly in a vertical direction as an Autogiro*



Two types of cylinders.

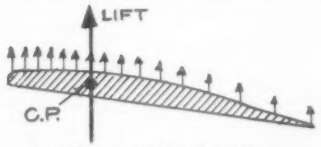
or other form of helicopter? Can the wings be made to lift up directly like the revolving airscrew of the Autogiro?

Answer:—WE have never seen an Autogiro lift vertically, hence we doubt whether this is possible. A certain length of horizontal run seems to be indispensable to this type of craft. The same thing is true of the airplane wing, but with a slotted wing and with a fair breeze going, the climb and hovering powers of the slotted wing are essentially as good as the Autogiro. At the Chicago Air Races, last year, the slotted wing "mystery ship" showed fully as good takeoff and landing as the Autogiro, both ships taking off and landing within a 100 foot circle.

* * *

QUESTION:—E. V. Brothers, Spokane, Wash. *Can you give me any of the characteristics of the old Wright Brothers ships? I believe that they were known as the Model B. Did they have a fairly high speed and were they easy to handle—or the contrary? What sort of control was used for them—stick or the instinctive control used by Curtiss?*

Answer:—THE old Wright Model B was a biplane with a wing area of about 440 square feet and weighed about 1,100 pounds empty. As the loading of the wings was in the



Location of center of pressure.

neighborhood of three pounds per square foot, they were necessarily slow and hard to control in anything but a light breeze. However, these very characteristics gave them a very quick takeoff and they left the ground after a very short run.

The controls were peculiar and required the continual use of both hands. The right hand lever moved back and forth and controlled the wing warping for lateral balance. At the top of this lever was a short handle that controlled the vertical rudder.

XUM

Gold Fish Shipped Safely by Air Express

SURELY when the day has arrived that live stock is shipped by air then all question as to the practical value of aviation is settled! And live stock is being shipped by air express regularly over the Pan American Airways to points in countries to the south of the United States.

Fish fanciers of Latin America have long wanted to breed certain species of gold fish but it has not been practical to bring them in from the United States. When they travel by steamboat the fish usually die or acquire the infirmities of old age before they arrive at their destination.

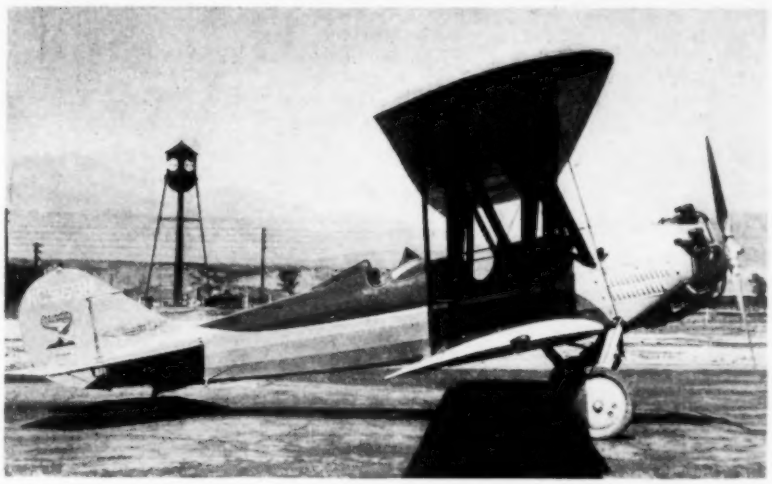
Jose M. Arias of San Jose, C. R., decided to import his finny pets and have them brought in by air. W. Trickor & Co. of Saddle River, N. J. expressed 19 pounds of them via air express to Senior Arias. Arriving in Miami, Florida, they were transferred to a Pan American air liner and departed thence for Costa Rica, via Havana and Central America.

Leaving New Jersey on July 24th they arrived at San Jose on the 29th. So quickly was the trip made that these fancy gold fish required neither food nor change of water while in transit.

Fancy gold fish are not the only live stock sent via air express over the Pan American Airways. For some time each week four million "bugs" have been carried from Peru to Louisiana, through Miami. These bugs are enemies of the sugar cane parasite and the planters in Louisiana are welcoming their importation into this country.

Would you call hatching eggs "live stock"? A shipment of extra fine hatching eggs was forwarded from Miami to British Guiana via the airline express. They could not have been forwarded any other way and reached their destination in condition for hatching.

New Alexander "Flyabout" in Production



Side view of Alexander "Flyabout" for training of the private owner.

TWO models of the new Alexander Flyabout two-seater light cabin monoplane were approved and licensed recently by the Department of Commerce.

One model is powered with the 38 horsepower Continental A-40 motor, the other by the 45 horsepower Szekely motor. Standard equipment includes dual controls, cabin heater and Goodyear airwheels. The Continental model has been flown over Pikes Peak at 15,000 feet and was flown 3,000 miles by a private pilot.

It averages 30 miles to a gallon of gasoline, affords all-weather utility and comfort, and flies "hands off" in any air. The Flyabout, believed to be among the lowest priced cabin airplanes in the world, was designed for private flying and training. Fuel costs for an hour's flying amount to 72 cents.

The following specifications and performance schedule for the model equipped with the (A-40) 38 h.p. Continental engine, will be of interest to light plane fans. The factory price is $1,465.

Wing span.....37 ft. 9.5 ins.
Length over all.....21 ft. 8.5 ins.
Weight empty.....573 lbs.
Gross weight.....962 lbs.
Landing speed.....28 m.p.h.
High speed.....80 m.p.h.
Cruising speed..... 70 m.p.h.
Climb.....350 ft. per min.
Take off distance.....175 ft.
Service ceiling.....8,500 ft.

When equipped with a 45 h.p. Szekely engine, there is considerable performance improvement:

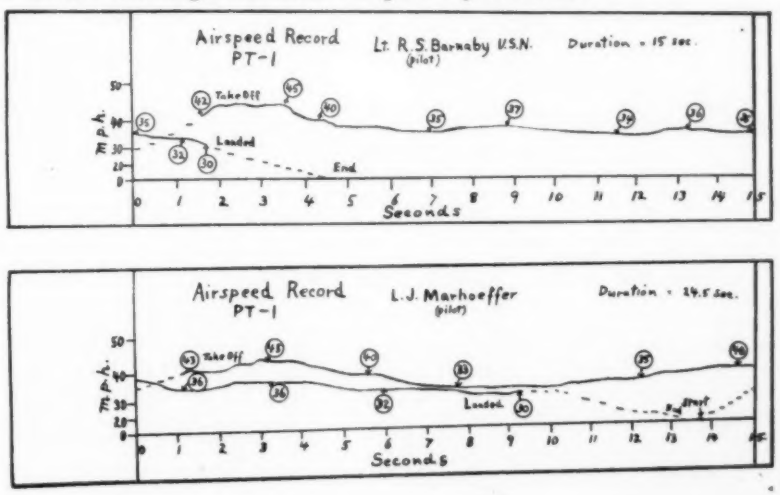
Landing speed.....30 m.p.h.
High speed.....93 m.p.h.
Cruising speed.....75 m.p.h.
Climb.....700 ft. per min.
Take off (distance).....150 ft.
Service ceiling.....13,000 ft.
Price ..... $1,590, flyaway

The price of the latter model is $1,590.

Scientific Recorder Shows Gliding Velocities Graphically on Chart

FEW glider clubs have conducted their experiments so carefully along engineering lines as the Washington Glider Club of Washington, D. C. Full data of the flights are carefully recorded by a specially devised airspeed meter which plots the airspeed against the duration in seconds as shown by the accompanying sample graph.

With a number of such graphs at hand, it is possible to compare the performances of a glider under varying conditions or the performance of a number of gliders during similar conditions. This, of course, gives design data of great value and it is therefore likely that this club will stand as one of the leaders in glider and sailplane development. Each graph is accompanied by a record of the barometric pressure, temperature and wind velocity.



The Airplane and Autogiro Compared

by EARLE OVINGTON

Each ship has its particular place in aviation, says this eminent authority

ON ACCOUNT of the nation-wide publicity given the Autogiro, there is a great public interest in this new type of airplane; also, a general misunderstanding of its characteristics and possible performance. A few words on the subject, therefore, will not be amiss.

Airplanes, as the term is generally used, may be divided into four classes. First, the ornithopter, or flapping wing machine, which has never been successful in the man-carrying size; second, the heliocopter, comprising an airscrew or airscrews rotating in a horizontal plane and attached to the engine and receiving power therefrom. Man-carrying heliocopters have been made and flown but they have only stayed up a few minutes and so far are very impractical.

Third, the ordinary airplane which is pushed or pulled through the air by its propeller, or propellers, and sustained by the action of the air principally upon the upper surfaces of its wings. Fourth, the autogiro, invented by a Spanish engineer, Juan Cierva, and perfected in this country by Harold Pitcairn, of Philadelphia.

Many uninformed persons confuse the heliocopter and the autogiro. In the case of the former the "windmill," as one might call the big air screw, is directly attached to the engine and it "screws itself" into the air just as you have seen the little toy heliocopters do.

In the case of the autogiro, on the other hand, the "windmill" has no connection with the engine except that it is started rotating by connecting it temporarily to the engine while the plane is on the ground and just before take-off. Once in the air, the "windmill" revolves freely upon its vertical axis and is kept revolving merely by the reaction of the air upon its blades as the autogiro is propelled through the air by a standard propeller just as in the case of the ordinary airplane.

Perhaps you will understand it more clearly if you merely consider that an autogiro is an ordinary airplane except that the wings, in the form of four narrow blades, rotate instead of remaining stationary as is ordinarily so.

The general idea that autogiros will shortly be taking off from the roof-tops is fallacious. An autogiro could take off from a fairly large roof, but so can many of the small airplanes on the market today. In both cases the difficulty is that the ships come down, pronto, in case of motor failure. The fact that one ship might hit you at a greater angle to the horizon does not mitigate the effect of the blow.

I am very enthusiastic, however, on the possibilities of the autogiro. It does land far more slowly than the ordinary airplane, and it can safely get out of smaller fields. It cannot tail-spin or nose dive. You cannot do aerobatics with it, that is, stunt it. It's merely a gentlemanly, well-behaved airplane for gentlemanly, well-behaved flyers, and as such has a great field of usefulness.

Aerodynamically, the autogiro has some disadvantages as compared with the ordinary airplane. More power is required to fly it a given speed, and it is nowhere near as fast as an ordinary plane for a given power. With three hundred horse-power, for instance, the top speed of the autogiro is about one hundred and twenty miles per hour. Frank Hawks is regularly flying at more than double that speed with exactly the same engine.

Earle Ovington, veteran flier, is pictured here as he appeared in his old Blériot monoplane —1910 to 1911.

Two views of an Autogiro on the ground. Note the drooping rotor blades and the large diameter of the rotor compared to the propeller.

When about to take off, the rotor is temporarily connected to the engine. When in flight it is disconnected.

Personally, I am convinced that the autogiro is the "missing link" that aviation is waiting for; it will get the man-in-the-street off the ground when he would not consider the ordinary type of ship. It will be the safe, comfortable "family plane" for the man who wants to indulge in the pleasure of flying, or wants to get to his destination without whizzing past a lot of speed maniacs on the congested highways of today. The young man, who wants to fly because of the "kick" he gets from the highly-maneuverable plane such as in general use, will sell his autogiro after he has had it a year or so; and so will the man who wants speed.

In other words, the autogiro has its place, and a very large and useful sphere it will fill; but it is not going to render the present type of airplane obsolete by any means.

XUM

Practical Lessons in Flying

by JOHN B. RATHBUN

Rolls and Spinning Nose Dives

BOB, the flight student and his instructor, Ed Keith, had arrived at the airport for their morning stunt flying practice. Some delay was occasioned by the tardy mechanics who were giving old No. 5 the once over before they rolled her out on the field for her day's misery. All was activity about the hangar, but it would be a good fifteen minutes until they were ready to start so Ed devoted the intervening time to conversation.

"Well, Bob," said Ed, "I see that you're all dolled up and ready for the morning's workout. If you're bright and eager for some rough stuff, your ambition will be filled—believe me. About the first thing on the program this morning, if those grease monkeys ever get her lined up, will be some rolls. Then the rolls will be followed by a few wartime battle maneuvers that you have read of in your favorite yellow backs but haven't seen. You may think that I'm wrong in running some of this old stuff, but as most of it was invented for emergencies it comes in handy once in a while."

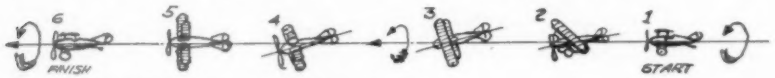
"Rolls, and all of the other gymnastics that go with them all come into the pilot's life once in a while, particularly if he's fond of following air circuses and other hilarious meetings of this sort. Some birds hang around for a chance to get into some prize money, and that's all right—if they get it—but I am a follower of the simple life and had rather drive one of these twenty passenger hotels. And I don't yearn for this briny deep stuff either—Egypt and China can wait a while before I honor them with my presence. Yeah, stunts are all right in their place when their main purpose is to give the student courage and self-reliance, but that is as far as they go with me."

Bob tried to cover a smile at this speech, for he knew that Ed detested stunters both professional and amateur, and that he taught stunting simply for the reason that it was placed on the bill-of-fare by his employers. Ed knew his Immelmanns and falling leaves, no man knew them better nor could execute them more precisely, but his heart was not in this part of the racket and he didn't preach the art.

Bill, king of the ground crew, gave them the high-ball and they walked out to the waiting ship ready for the start. Bill, with unusual courtesy and consideration had wound up the stick and the engine had started idling just before Bob had started his pre-flight inspection. In accordance with Ed's instructions, Bob had never omitted this part of the ritual even though the ship had just left the hands of the mechanics. He knew perfectly well that everyone was liable to mistakes and omissions and that this rule extended to airplane mechanics as well as to everyone else. Safety first in the air!

After a few moments standing, the engine had warmed up and was idling regularly. Bob, with a long experience now behind him, climbed into the rear cockpit while Ed oozed into the front compartment with all the ease of a veteran. "O.K. Bob, give her the gun and take her up to the three-grand mark."

They climbed steaily, the old OX-5 sticking to the job without a miss until Bob finally leveled her off at the 3,000 foot mark demanded by Ed. Bob waved his hand for further instructions from the front cockpit and then the phone began to talk.



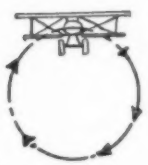


Fig. 1, above, shows roll seen from side. Fig. 2 is the front view.

"Now, we're going in for rolls, barrel rolls or any other old kind. And some call them 'wingovers,' which is much the same thing," said Ed. "However, no matter what they call them, the main thing for you to do is to look at your belt and hold on with all your strength. This is a bad time to be wearing a bum belt, and I'll ask you to look yours over before we start anything. All right, look it all over from the webbing to the buckles and clips. Don't forget anything, and while you're at it, find a nice solid place to hang on. This snaps over quick and the centrifugal force will pull you out of you're seat plenty."

Bob signalled in reply, handed the controls over to Ed, and began a minute examination of his safety belt. O. K. He waved to Ed, and then the roll began as shown in Fig. 1.

"And now we will look at a revolving landscape," said Ed. "This is sometimes known as the 'sideways loop' and is very easily done by getting up speed, pulling the stick back and kicking on full rudder. Hang on—and watch."

Suddenly the landscape in front of them made a complete revolution and then another and then another. It was all Bob could do to hang on against the violence of the centrifugal force in the quick snappy revolutions. They had the engine on, but because of the limited power they lost altitude at every roll. Finally, the rolling stopped and they leveled off after a sharp dive for bringing up their flying speed. And that was that.

"I thought that we would turn about the center of the fuselage just as if the body were a shaft," said Bob, "but we didn't seem to do this so far as I could see. We seemed to make an angle with the course and at the same time seemed to be looping around it."

"You're right," said Ed. "We don't whirl around the center like a spinning top, but actually revolve around the flight line in a small circle (See Fig. 2), just like a little loop although the loop in this case is at right angles to the flight line instead of being in line with as in a regular loop. And as you say, the tail and body make an angle with the flight line so that the tail group describes a larger circle than the nose. It's a good thing that the old crate won't swing around her center, for I doubt that any safety belt in the world could then hold us in."

"AND now, old timer," said Ed, "we'll be after trying that spin stuff. This ship pulls out of a spin easily, in fact it will take itself out of a spin eventually if you have plenty of space between you and the ground. However, we have some other ships hanging around here that are not so pretty in this respect, and you'll have to do some tall fighting with them to get them out before you swipe them on the ground. You remember that old green and white buzzard, old No. 7, to be more exact? Well, when she gets into a spin she specializes on it and there is only one little stunt that will get her out—and that little stunt has nothing to do with the controls at all."

"I'm going to let you into a deep secret," continued Ed. "In the case of old No. 7, and a few ships of that type, you can hang on to the controls until you bore a nice hole in the ground like an augur, but she'll only get tighter and tighter into the spin. Now the recipe for these old bull-heads is to stand up in the cockpit so that you raise the center of gravity, and if necessary, turn wing-walker and climb up the struts until you get her heeling over. If the center of gravity is too low, and this may also be caused in a farily spin-resistant ship by putting a heavy load on the floor, then the tendency will be to tighten up the spin rather than to break it up.

"Now, you know plenty of how to

get into a spin accidently—you've done that repeatedly ever since we started out, but I'm now going to show you how to get her in purposely and then take her out. Operation No. 1 is to stall her. Operation No. 2 is to get her over on one wing at the same time. Nature and gravity will take care of operation No. 3 without any attention from you. Up comes her nose on the stall, over she goes on one wing, down drops the nose and you're off on the spin."

Bob nodded assent to this talk. He had heard it many times before. However, even in spite of his previous experience with this stunt, he dreaded to pull the controls that would start the ship down on her dizzying circle. He knew, just as Ed remarked, that this particular ship was easy to take out of a spin and would take herself out after a time with the controls in neutral. The side areas and the center of gravity were so arranged in the design that the spinning forces were small.

They were sailing around at about 4,000 feet while Ed was giving his lecture, a lecture of this sort in action being many times more effective than when conducted in a class-room or on the ground. They were slowly gaining altitude with the intention of getting up to about 5,000 feet before starting the spin, for with an amateur it is always best to get a good distance off the earth in case that the ship should not come out as promptly as estimated.

"When you get into a spin," explained Ed, "the tail circles around the line of descent with the body at a slight angle to the vertical so that the ship actually rotates about the center of gravity. You don't come straight down, spinning about the center of the fuselage as you may think, and its a darn good thing that you don't, for in such a case it would be almost impossible to get a rudder that would be effective enough to bring her out.

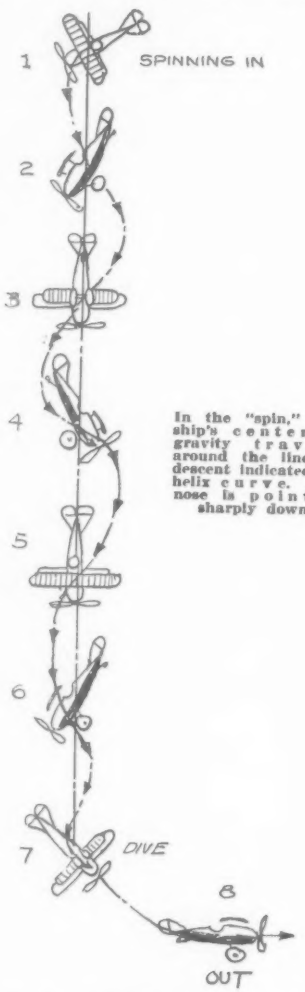
"Well, here we go."

Ed pulled back on the stick, cut the engine and ruddered hard to the right. It was only an instant when the nose went down with the ship standing on her wings, and then the ground beneath them swung round and round in a dizzy circle (Fig. 3). This went on for four or five revolutions, the rotation gradually slacked and then stopped, she came out on a dive and then Ed cut in the engine. Everything was now as serene as before.

"What did you do that time," asked Bob. "I watched closely but I didn't notice the controls move any."

"You're right—they didn't," replied Ed. "When I got her into the spin I centered the controls in neutral and let her do the rest of it herself. She came out, just as I told you she would, and all I did was to lean back and enjoy the animated scenery. She usually takes from three to four turns, and then she gets sick of the racket herself and stops it. You have to fight the rest of the crates a lot harder than that, and after you take this ship out of the spin, just to get a little experience we will take No. 4 up and battle her out of her intentions. She's hardboiled in spins and don't you forget it. She's so hardboiled in fact that she may give you your first chance at bailing out. Come on, start back to 5,000 feet and go through the stuff yourself. After that, we'll go down for No. 4 and you'll see a whale of a difference."

Bob took her up, and got her into the



In the "spin," the ship's center of gravity travels around the line of descent indicated by helix curve. The nose is pointed sharply down.

spin as per directions. After a few turns with the stick centered she came out as before. Nothing to it at all, and Bob suddenly grew very brave and self-confident until the thought of No. 4 gave him a sinking in the pit of the stomach with a brilliant opportunity ahead for using the 'chute. No. 4 was an old jillopy that had always been threatening to crash for a long time—but Providence seemed to hover over the old crate and she had always been pulled out just in the nick of time. She had been worked on and altered a dozen times but they had not found the trouble yet.

After the spin, which had reduced their altitude by about 1,500 feet, Bob glided her down and landed the ship as usual.

IN THE meantime, No. 4 was standing ready for the test and Bob thought, as he turned the engine over, whether this little trip was going to turn out as well as the others that he had taken.

The engine warmed up, they started off on their adventure which brought them back to their original altitude of 5,000 feet. The ship handled nicely during the climb and there was no hint of a tendency toward spinning mentioned.

"Better get a little more height," counseled Ed over the phones. "Air doesn't cost anything—just yet—and it may save us something. Give her 7,500 feet before you jerk her snoot up into the air. You may need all of it but the last six inches. Now give it to her, but for the love of Pete, cut the engine first or we'll get our feet all wrapped around our necks."

The ship went over into the spin, but when the controls were put into neutral she spun away tighter than ever and paid not the slightest attention to them. This was something new and disconcerting. Bob ruddered against the spin but she had the bit in her mouth and laughed in his face—so to speak. Meantime old Mother Earth was rushing up to greet them at a tremendous clip. If rudder or stick had no authority something had to be done and done quickly, and then Bob thought of his 'chute pack for the first time.

"Break loose from those controls," ordered Ed. "I'm going to rock her out. She's locked tighter than hell. Watch me work back and forth with the controls so as to get her swinging and then watch me swing her out. If that don't work—it's overboard with us. I've seen her grab hold but never like this."

Ed tried to rock her into a steeper dive and then ruddered hard against the spin, but nothing doing as yet. This occupied only a little time—less time than it takes to tell it—but it seemed to drag on for hours. Finally, with the stick pulled hard back and by intermittently forcing the rudder against the spin, she broke loose from the rotation and then leveled out just as nice as you please. The altitude was 2,000 feet and a great number of turns had been made.

"Whew, that's going some," exclaimed Ed. "I was just on the point of yelling 'bail 'em out' when the rudder took hold. This old bunch of junk is the crabbiest old crate in the business, but I've got an idea of what to do the next time that we try it. Now, I'm going right on back again and see if my hunch is right. They've put new fins, new rudders and everything else on this baby, but I think that they have overlooked the big idea, and that is, to raise the center of gravity. So, when I tell you to, just stand up in your cock-

(*Continued on page* 55)

Airplane in Role of Detective

A WEALTHY resident of a small city in Germany was surprised recently to find a square box upon her doorstep. The box contained a carrier pigeon. In the box was also a note demanding a ransom equivalent to $500 in American coin which was to be placed in a small bag tied to the pigeon's leg and the bird released. The penalty for failure to carry out the demand was the threatened bombing of the residence.

The lady called in the police of a nearby city, who enlisted the help of a local airplane company. Three pilots were engaged, and at an appointed time were soaring over the house. The pigeon, with a bright red streamer attached to its leg, was released and attempts made to follow it by plane. After several circling attempts to get off, it started across country at a high altitude followed by the planes.

Travelling to a neighboring city, it entered a loft of an old residence. One of the planes circled about the house while the other two, by prearranged signals, attracted the attention of the local police. Raiding the house, the police surprised two men as they were removing the streamer from the leg of the bird. They, however, denied ownership of the pigeon.

The bird was taken out and set free again, whereupon it returned immediately to the house. Several such trials were made, the bird being taken as far away as fifty miles after which it returned to the same house each time. Confronted with the results of these trials the prisoners confessed the attempted extortion and are now awaiting trial.

Get Warm Meals on Akron

A SPECIAL cooking stove has been developed for the new Navy dirigible, the Akron, and will soon be installed in the dirigible's galley. The stove weighs only 110 pounds, on which can be prepared meals for the dirigible's personnel of ninety-nine officers and men.

Like many other fittings in the Akron, the stove had to be constructed of weight-saving materials. In it, cast and sheet aluminum predominate. Chromium-plated steel, nichrome, stainless steel, magnesium were combined with smaller units of cast iron and bronze.

Propane gas, derived from natural gas, will be used as fuel for the stove. The gas will be compressed into liquefied form and carried in special light cylinders. Storage tanks for sufficient quantity for twelve days' use have been installed in the dirigible. The stove is flame proof, as the air from the burners enters through flameproof gauze, and the possibility of explosion is eliminated by constantly-burning pilot lights.

Wartime Airplane Insignia Made Clear

THERE are many people today who are interested in but who know very little about the systems of identification used in the late war.

To begin with, each of the allied countries used different cocades or "circles." This device consisted of three concentric circles usually thought of as being red, white, and blue.

However, these colors were only used by England, France, and the United States, each with a different arrangement, as shown in Fig. 1.

The "star in circle" as used today was also used by the U. S. before we entered the war, and continued in use here on training ships. In active service on the other side, however, the old Russian insignia was adopted.

The U. S. also striped the rudder differently, beginning at the post with red, then white, and with blue at the trailing edge. France and England used the opposite, starting with blue.

As shown in Fig. 2, the Italian and Belgian cocades used other colors. Also

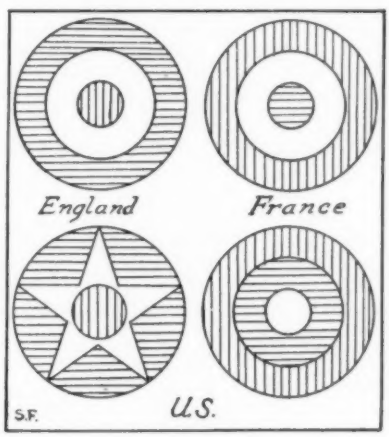


Fig. 1.

the Italian planes at the beginning of the war had the wings painted as shown, but this was later abandoned.

The German insignia is shown in Fig. 3. The oldest form was the Maltese Cross in a circle, No. 1. Possibly this was too easily mistaken for the allied cocade, being of circular form, as a later development was the type of cross shown at No. 2. The last cross (3) was said to be adopted in April, 1918.

There is an interesting rumor in connection with this sudden changing of the type of cross, though the writer does not know how true it is. It is to the effect that because the allies were sending over captured planes with their original markings and doing considerable damage, the German High Command ordered that the crosses be changed overnight from Maltese to straight. This was so that the raiding planes could be identified, for a short time, anyway.

The red flag shown at No. 4 was

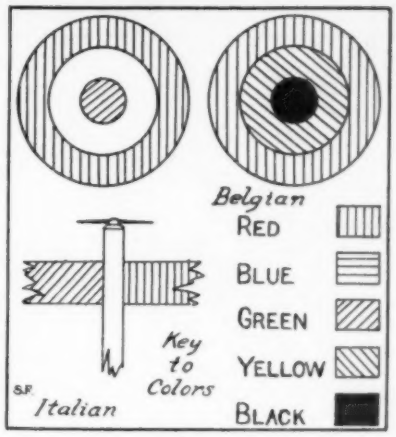


Fig. 2.

fastened to the lower wings of the planes used by the German Navy.

Another point that seems to be very hazy concerning war planes is the matter of designations. The two systems were the French and the German. The English used no special system, and the U. S. used the French.

In the French system the planes were divided into three groups. First, A, standing for "Artilleres," being used for observation, etc. Second, B, for "Bombardement." BN and Bn being "Bombardement de Nuit," or night bombers, heavy and light, respectively. Third, C, for "Chasse," or pursuit planes.

After the type letter comes a number which tells how many occupants the plane carries. Before the type letter comes the maker's name, and sometimes his model number. Thus we have "SPAD XIII C.1," which means: Make, SPAD; maker's number, XIII, single seater pursuit.

The German designations were not so elegant, however. C stood for pursuit and observation, D for fighting, and G for bombing. This type letter was preceded by the make, and fol-

(*Continued on page* 64)

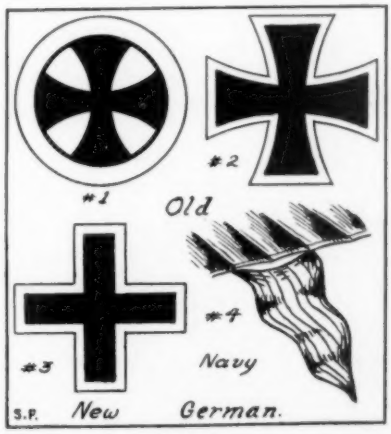


Fig. 3.

The Round Robin Club

A correspondence plan for POPULAR AVIATION readers.

THIS summer vacation business is to blame for a whole lot of slack conduct, and then we must drag in the hot weather as an explanation for many misdeeds. Several of our groups have laid dormant for two or three months because one or two members in the magic circle have been away from home. This is not lack of interest, at all, but is simply just one of those things that always happen about this time of the year.

We have just started another club on its way, and have nearly enough members to start a second group. Applications are coming in steadily, at least for the summer months, and everything will be hitting on all six again as soon as the temperature drops and when it is too cool to sit around out of doors at night.

It's funny how a number of these clubs all break out with the same big idea, all at one time. During this month, those of the clubs that were operative, all started discussing that old favorite argument—is the wood ship superior to steel? After that is all threshed out to everyone's satisfaction, we will start on something else—and whatever it is, we are willing to bet that several clubs fall on the same idea.

Just as a matter of personal interest and curiosity, we would like to have one or more clubs start a debate to decide whether the water-cooled or air-cooled engine is the superior type. There are more angles to this subject than you would think at first glance, and you can have a good old-fashioned gab fest on cooling methods.

Still another stunt that has been hanging around in our minds for some time, for the benefit of those who wish to take up the study of aviation seriously, is to start a sort of book club with some standard work on airplanes as the basis of the debates. If this is carried out systematically and carefully, and we have seen it carried out on other subjects, the benefits to be derived are very great.

J. B. Rathbun has taken a great fancy to this study scheme and will give his assistance to those who are up against any engineering entanglements. A whole lot of things come out into the light, of course, by abstract arguments, but much more is gained where the arguments are controlled by a systematic and united study. We would really like to see this Round Robin idea work out into something really worth while, and you can do it if you put your mind to it.

For the benefit of the beginners, who have not been following the Round Robin's progress, we will make a few explanations as to the conduct and purpose of this organization. In the first place, you join the Round Robin Club by sending in your name, address and age to Popular Aviation, 608 S. Dearborn St., Chicago, Ill. Your age, even though approximate, is of great assistance to us in placing you in a club made up of members of your own age.

Next, you will be assigned to a club or section having nine members beside yourself, and you will be provided with the names and addresses of the members in this club. Then you will write a letter to the man assigned to you on any subject that you like. He in turn will send your letter and his to the next man, and so on, until the last man receives nine letters. This last man starts it around again, and so on, keeping at it indefinitely. This system saves a whole lot of letter writing, for nine members are covered with only one letter by each man. When the letters get around the second time, each man takes out his first letter and replaces it with the second.

This idea, originated by Donald Boggs, has proved very popular and affords a means of getting acquainted with others who have been bitten by the aviation bug. Sometimes it is difficult to find a person who is interested in your hobby, but this makes it a simple matter.

Just to establish a system that will avoid confusion, the letters should follow in the order indicated by the numbers attached to the names. Thus, (1) writes to (2), (2) writes to (3), and so on.

Club No. 6, now being formed, includes (1) Glenn Most, Walnut Creek, O.; (2) Joel Steel, Petersburg, Pa.; (3) Charles Hunter, 189 E. Main St., Salinville, O.; (4) Elmer Swanson, 440 W. 66th St., Los Angeles, Calif.; (5) Geo. L. Dauzenroth, 1910 Windsor Road, Dayton, Ohio; (6) Joy Palmiri, 1347 69th St., Brooklyn, N. Y.; (7) Alex Mikeshock, Manville, N. J.; (8) Joseph Dush, R. F. D. No. 3, Newark, O.; (9) Walter Haufe, 414 Oak St., Neenah, Wis.; (10) Charles Sullivan, 1870 E. 90th St., Cleveland, Ohio.

Airplanes Used on Whalers

AIRPLANES are being introduced to another industry—whaling. The S. S. Kosmos, the largest "factory ship" ever to be built, has just left the steamship yards. She carries, besides the latest in modern whaling equipment, two seaplanes of the latest design.

These planes have been equipped with radio telephone, powerful sea glasses, and facilities for landing upon the choppy waters of the North Atlantic.

No longer will the lookout in the "crow's nest" shout "Thar she blows," but instead, the alert observer in the plane, flying high above the ship, will flash the number of whales and their position to the bridge of the Kosmos.

Airplane's Birthplace at Kill Devil Hill

KILL DEVIL HILL, that towering sand dune near the little Coast Guard station of Kitty Hawk on the North Carolina coast, from whose crest the Wright Brothers launched the first successful airplane flight on December 17, 1903, stands out in dark relief today against the dazzling white of the other sand dunes that dot that section of the coast.

The birthplace of aviation, an international shrine to aviation, now that the work has been started upon the erection of a $225,000 memorial to the first controlled flight of a heavier-than-air craft, has been securely "anchored" by the planting of grass and shrubs along its sloping sides to halt its wandering tendencies.

Original Kill Devil sand dune.

Since the Wright brothers made their famous flight the hill, shifted bit by bit by the high winds that often sweep this section of the coast, has moved more than 600 feet! Within a score of years, had not its advance been halted by its coat of grass, the famous hill would have marched entirely across the narrow spit of land upon which it is located to disappear beneath the waters of Currituck sound.

Kill Devil dune of today

The work of "anchoring" was started early in 1929 and the hill today is covered with a dark green carpet of sturdy grasses and shrubs.

This hill has seen, not only the original glide but the first soaring flight recorded. This was of about 10 minutes' duration.

XUM

How to Build the Buzzard

by POP STICK

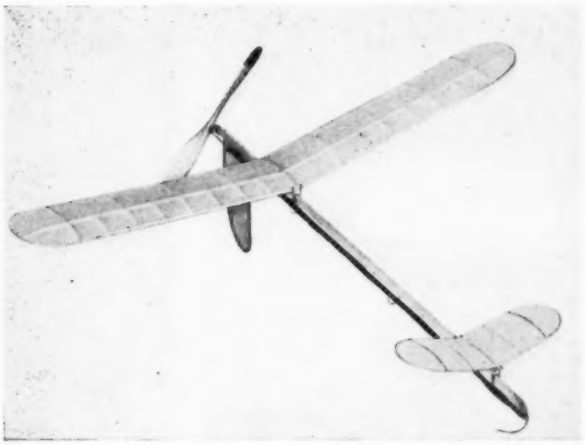
A WELL designed pusher using one propeller, will make long duration flights, and when reaching the upper currents, will maintain its altitude from 5 to 10 minutes with the motor run down and the propeller developing no power. The dihedral in both the stabilizer and main wing is very pronounced. To prevent the torque from causing the model to dive, a small rudder is placed at the lower rear end.

The glide for this 24-inch model is nearly flat and from 4 to 6 strands are necessary for motive power.

The main wing is double surfaced, and the model may be used either as a fast or slow flyer, depending upon the amount of rubber used.

No angle of incidence is used on the large wing. The drawing clearly shows the construction and gives the dimensions necessary, just as required.

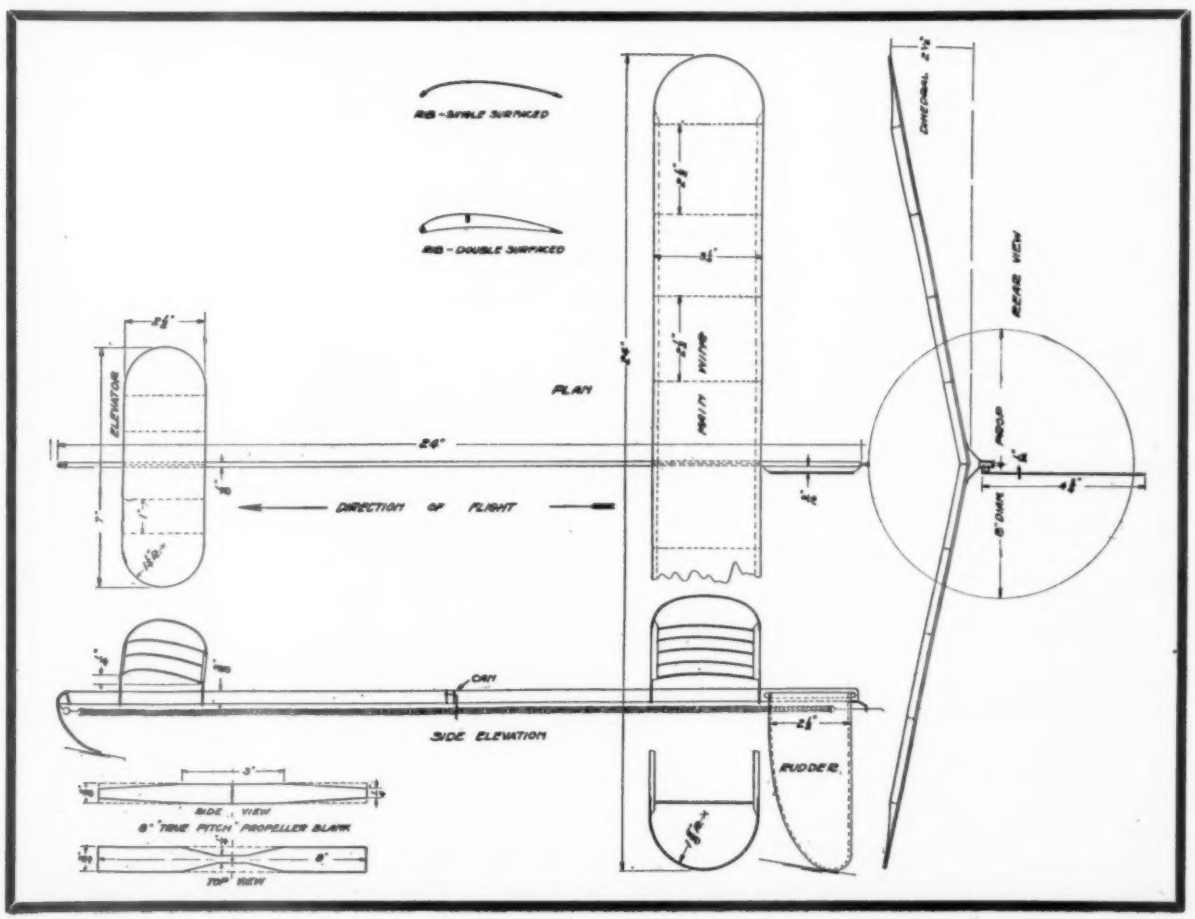
Small additions of weight do not matter on this type of model and the complete plane may be built from either pine, bass or spruce in addition to the general wood (balsa) which is used in 90 per cent of the cases.



The completed model of the "Buzzard" duration and soaring model. Carefully made, this will give unusually good results.

So the model will be clearly visible, paint the wing tips red or green. In some cases the height reached puts the plane beyond vision and the dark tips will help to keep it in view.

As with all models of this type, the alignment of the surfaces and the adjustment and balance have a great deal to do with its performance. Try it out carefully to avoid breakage and then make the final adjustments until the best results are obtained.



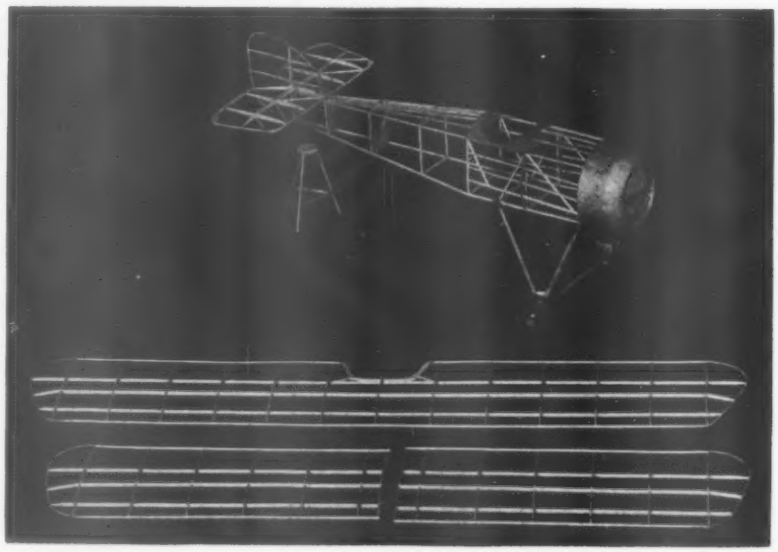
MODEL DEPARTMENT

How to Build the Sopwith Camel

Designed

by

JOSEPH S. OTT



Photograph of actual frame work of fuselage and wings as they appear after assembly and before covering.

THE Sopwith Camel presented in this article is designed and built as a flying scale model, maintaining the exact place and position of the wing and tail parts as in the full size machine.

The models presented in POPULAR AVIATION during the past seven or eight months were built and designed to represent the last machine of its type but disregarded the exact scale outline. The previous models have so far weighed only 1½ to 2 ounces, but the Sopwith Camel's illustrated weight is 3¾ ounces, ready to fly.

To maintain the exact position of the wings so that the true scale appearance is maintained, it is necessary to add more weight in front to offset the length of the body.

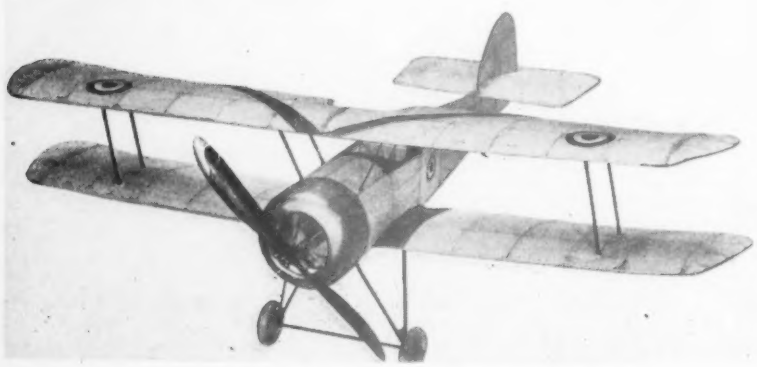
Suggestions for maintaining a more true-to-scale flying model were offered by Mr. Christy McGrath of St. Louis and Mr. A. J. Hoover of Taxgonnia, Kan. Mr. Hoover sent a large size drawing from which the present model was developed.

Mr. McGrath says, that when using a model with a heavy nose, that the actual flying duration and stabilization is not decreased in the least. In fact, the actual stabilization of the model is improved. For example, when the model stalls, the greater weight in front will make it less wobbly and will immediately bring it back into a gliding or level position.

Notice that on the drawing and the actual model there is a small increase in the landing gear height. This height adds to the attractive appearance of the model and does not make it appear quite as squatty as the long type planes. Still, the long models of the pursuit types all have high landing gears.

Abbreviated Building Instructions

No. 1. Body.
No. 2. Nose cowl.
No. 3. Cowling top and bottom.
No. 4. Landing gear.
No. 5. Tail skid.
No. 6. Rudder and stabilizer.
No. 7. Ribs.
No. 8. Assemble wings to body.
No. 9. Outer struts.
No. 10. Motor stick.
No. 11. Propeller.
No. 12. Clips—motor stick.
No. 13. Thrust bearing and shaft.
No. 14. Decorating—emblems.
No. 15. Flying.



The completed model of the "Sopwith Camel"—ready to fly.

MATERIALS

No. 1. Body — 10 pieces — 3/32"x3/32"x 30"—Balsa.
No. 2. Landing gear — 3/32"x¼" — hard Balsa.
No. 3. Tail—2 pcs.—1/16"x¼"—hard Balsa.
No. 4. Wheels—for 24" model use, wheels 1⅞" diameter; for 30" model use, wheels 2¼" diameter. Either celluloid or built up Balsa.
No. 5. Struts — 2 pcs. — 1/16"x¼"x 15"—Bamboo.
No. 6. Fittings, piano wire—diam. .029.
No. 7. Propeller — ⅝"x1"x10" — Balsa.
No. 8. Motor stick — 3/16"x5/16"x12" long—hard Balsa.
No. 9. Rubber motor—10 ft.—⅛"—30 gauge.
No. 10. Spars—4 pcs.—⅛"x⅛"x30".
No. 11. Trailing edge—3 pcs.—1/16"x ¼"x30"—Balsa.
No. 12. Entering edge—2 pcs.—⅛"x⅛"—Balsa.
No. 13. Tissue — 3 pcs. sheets — 18"x24"—Super fine.
No. 14. Rib stock—Balsa 1/32" or 1/16" sheet stock, approx. 2"x30".
No. 15. Lacquer—Black glossy for struts.
No 16. Cement — ½ oz. unit.
No. 17. Banana liquid—Small can.
No. 18. Lacquer — Red glossy and aluminum for propeller.
No. 19. Washers — 3 ea.
No. 20. Allied war emblems.

DETAILED INSTRUCTIONS

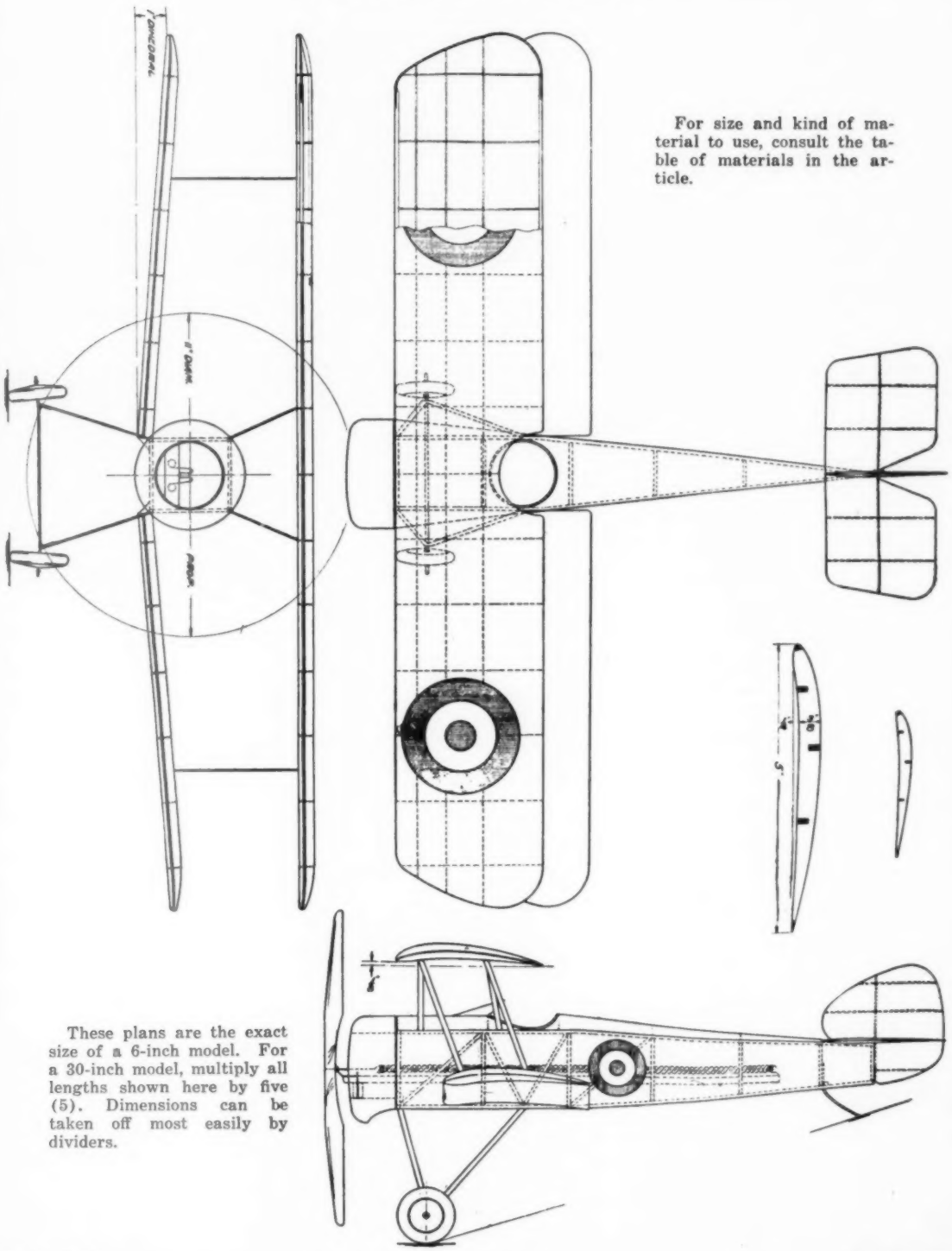
Body—No. 1

The scale of the plan, as illustrated, is 1 to 6 inches. Any size enlargement may be had by multiplying the ratio (6) by the wing span so that the actual

(*Continued on page* 44)

The Sopwith Camel

A Flying Scale Model



For size and kind of material to use, consult the table of materials in the article.

These plans are the exact size of a 6-inch model. For a 30-inch model, multiply all lengths shown here by five (5). Dimensions can be taken off most easily by dividers.

building span may be had. For example—3 x 6 will 18" wing span, 4 x 8 will be 24" span, and 5 x 6 will be 30" span. The model builders that have written to me have expressed their satisfaction with this method as being more suitable than showing the diameter of one specified size.

The general construction of a scale model may be given with only such differences as the shape of wing and its location, shape of the rudder and stabilizer and body with a circular section. The same method may be applied to any type of circular fuselage when following the sample outline.

Draw without the outside sides on height and length of the fuselage. Then make the longest cross-section and build a square body that will fit in the inside of the oval section of the fuselage. After the square part in the foundation of the body is completed, the top cowling, the sides and the bottom may be added by using 1/32 inch sheet Balsa that will make the outside conform to the proper shape as desired.

Notice in the front view that the longest square area is illustrated by dotted lines. For this particular model there is a slight taper at the round on the side view. On the top view there is a complete taper to where the rudder connects to the fuselage.

Nose—Cowl—No. 2

The nose of the model, which represents a cowl, is made of one solid piece of Balsa. The total weight of the nose should not be less than one ounce. If the model has been completed, and the tail is still heavy, small metal pieces should be cemented on the underside of the cowl so that proper balance is secured.

Cowling, Top and Bottom—No. 3

The nose is fastened to the fuselage and the top view illustrates the length of the cowling employed. The side view shows the amount of cowling necessary to round off from the nose to the rudder.

Landing Gear—No. 4

Bamboo, approximately 3/32 x 5/8 inch, is used to build this entire plane. The axle is also made of Bamboo and is constructed on the under side of each model so that the wheels may run on the Bamboo in place of side axles. Most celluloid wheels have large holes. This utilizes and prevents a wobble in this type of wheel.

Tail Skid—No. 5

The tail skid is a small piece of Bamboo projecting into an added part on the lower strut of the fuselage cross member. This is held in place by cementing. A slight curve on the lower end of the strut is desired so that the model does not catch on any object to rest.

Rudder and Stabilizer—No. 6

The original model was built with a cambered surface. The cambered surface was found to be very strong, but a little more work was necessary because of the added parts above and below the spars. This necessitated the addition of three ribs as illustrated. The rear end of both the rudder and stabilizer is made of a piece of thin Balsa 1/32 x 1/4 inch scalloped.

Ribs—No. 7

The ribs for this model are very thin, and care must be taken that the cut-out section for the spars does not leave the ribs flimsy, causing them to break before they are mounted in place. The upper and lower ribs are the same for both wings.

Assemble Wings to Body—No. 8

The top wing has more dihedral and the dihedral in the lower wing is specified on the drawing. When using a low pitch propeller it will travel at a high rate of speed. The lower wing is built in two sections and connected by cement directly to the lower longeron. The incidence is equal to 1/16 inch on the edge.

Outer Struts—No. 9

The outer struts are made of Bamboo 1/32 x 1/8 inch and should be cemented to the top wing, allowing them to project downward further than necessary until the lower wing is put in place. The lower wing should be attached to the fuselage with pins aligned and then cemented in position.

Motor Stick—No. 10

The motor stick may be made of hard Balsa or Pine depending, upon the material on hand, or such material that has been found to be most suitable by the model builder for this particular part. The size of this part is approximately 1/4 x 1/4 inch for Pine and 1/32 x 1/8 inch for Balsa.

Propeller—No. 11

The landing gear is built to take a 11 inch propeller. If a 12 inch is desired, it will be necessary to have the landing gear a little bit higher to compensate for the added length.

Clips—Motor Stick—No. 12

A piano wire clip to fit around the motor stick should be bent to the shape illustrated in the front view of the drawing. Cement this clip on the inside of the nose block, then add a small piece of thin Balsa over and against the clip to help keep it in place. This method insures a strong and rigid vise-like grip over the clip and prevents it from being pushed out of place when the propeller strikes an object.

The motor stick is held at the rear, directly below the cockpit, by cutting

(*Continued on page 47*)

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10 pieces 1/16 sq. x 12.....	3c	6 washers.....	2c
5 pieces 1/16 x 2 x 5.....	8c	6 sheets Sand Paper.....	8c
5 pieces 1/32 x 2 x 5.....	8c	10 ft. No. 6 Wire.....	3c
50 ft. 1/16 flat Rubber.....	12c	10 ft. No. 10 Wire.....	4c
50 ft. 1/16 flat Rubber.....	25c	6 sheets tissue.....	18c
1 pr. Celluloid Wheels, ½ in.....	5c	2 oz. Colorless Cement..	14c
		2 thrust bearings.....	3c
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NOW—*America's Leading Designers of Model Aircraft Kits offer you*—the two best known American War-Time Planes in Kit Form

All views shown here are actual photographs of Cleveland-Designed models

Cleveland-Designed DH-4 in full flight

DE HAVILAND—4

First American Battle Plane

HERE'S real news, fellows! The first of Cleveland's big winter surprises. Don't miss a word of this rapid-fire message—study the photographs carefully—aren't they beauties? Even aviation experts frankly state Cleveland models look like the real ships. Cleveland aims at perfection—maybe that's why.

Now for the De Haviland-4! It's one of the neatest ¾-in. scale flying models you've ever seen—with its span of 32-in and 21⅝-in. length. Weighs only 3.5 ounces; and certainly is stunning—all yellow—with black equipment and trimmings. It's a cinch to make all the equipment, too—which includes the twin Lewis machine guns with sights, handles 'n' everything, mounted on a movable scarf ring—turn 'em up, down or around in any position, twin (fixed) Marlin guns, five 25-lb. bombs, two 100-lb. bombs (the little propellers and everything on them), wing tip lights, rear light, windshields, all flying, landing and brace wires—to say nothing of control wires, control horns and movable controls. Many other dandy features.

Best thing about this beauty is you don't have to make all the above mentioned details if you don't want to—and last, but not least, its flights will give you the thrill of your lifetime.

Study the bombs, guns, etc. Cleveland-Designed DH-4 drawings show everything full size

The No. SF-3 kit to build this model, 100% complete with full size drawings as all Cleveland-Designed kits are, will be shipped to you for *only* $4.75. Think of it—and then don't forget what a nifty Christmas Gift it will make, too! (Note to English Aeromodelists: Change this model over to the English DH-4 from photographs if you have them. Only changing the nose to suit your requirements is necessary). See coupon below.

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XUM

WOMEN'S ACTIVITIES
Edited by Lady Mary Heath

Mrs. Fairgrave Omlie, flying her Monocoupe, was announced winner of the Women's division. She also won the $2,500 car given to the man or woman who made the biggest handicap score. On August 31 she also won the thirty-mile event for machines of 510 cubic inches displacement. Later in the day she won the 650 cubic inches displacement in the same machine.

Lady Mary Heath.

* * *

Miss Margery Stinson, the only female "Early Bird" in the world, was also present and attended the annual reunion at the Hotel Statler.

* * *

Mrs. Amelia Earhart Putnam was also at Cleveland with the Beachnut Packing Autogiro and led the daily Autogiro exhibition flights.

* * *

Miss Dorothy Hester of Oregon gave five daily exhibitions of stunting. She holds the world's record of 62 outside loops for women.

* * *

Miss Winifred Spooner, who has recently been elected to the Executive Committee of the Air League of the British Empire, was the first English woman to enter the National Air Derbies.

* * *

Mrs. Clema Grainger flew Mrs. Ruth Elder Camp's plane and was backed by Miss Joan Bennett, the movie star. She took four portions of lap prize money. Mrs. Ruth Elder Camp is hoping to win her husband's consent to fly in the next Air Derby.

* * *

Mrs. Opal Kunz took an important part in the closed course races and her "Betsy Ross Corps" gave a dinner dance on Friday evening at the Lake Shore Hotel. The Corps was represented in Cleveland by Lt. Commander Martha Morehouse Johnson.

* * *

The women pilots in the Transcontinental Derby were entertained at a luncheon with Mrs. Amelia Earhart Putnam by the Cleveland Women's Aero Club on Wednesday. Mrs. Ralph Rex has been made an honorary life president, in recognition of her work.

* * *

A number of entries were accepted in the Aerial Trophy Race, a speed race for women. The winner was Miss Maude Irving Tait, who won at over 209.12 m.p.h. On September 8 she attempted to better Miss Ruth Nichol's 210.64 m.p.h., the present woman's speed record, but failed.

The principal women prize winners are as follows: Mrs. Mae Haizlip, $7,700; Mrs. Fairgrave Omlie, $4,250, including an auto worth $2,500; Miss Florence Klingensmith, $4,300, and Miss Maude Irving Tait, $4,200.

* * *

Dean Esther Gaw has forbidden the use of airplanes in the Governing Rushes for Sororities she controls.

* * *

Miss Dorothy Weiner has been put in charge of the air traffic in Kansas City for American Airways, Inc.

* * *

Miss Amy Johnson arrived back in England on September 9, after her trip to Tokyo. She took ten and a half days to get there, making a new England-Japan record. On July 28, she put up an official record for women's flight distance in one day. She reached Moscow, 1,650 miles from England, where she started.

* * *

Miss Lauretta Schimmoler, an aviatrix who operates the airport at Bucyrus, Ohio, had a gathering of 10,000 to see the airport dedicated. A fine program of races and competitions was put on.

* * *

The Miami Aero Club has recently organized a Girls' Squadron.

* * *

Archduke Anton of Hapsburg, and his bride, Princess Ileana of Rumania, are still on their flying honeymoon in the Puss Moth given to them by King Carol, the bride's brother.

* * *

Fraulein Marga von Etzdorf, a German aviatrix, is the second woman to fly through Siberia. She flew from Berlin to Tokyo in 12 days. She used a Junkers Junior.

* * *

The first all women's aviation meet to be held in Europe was conducted by the women members of the Northampton Aero Club at Sywell Aerodrome, Northampton, on Sept. 19.

* * *

The Lioness "Lifesaver," who has flown all over the United States with Capt. George Hutchinson, is ill. She is in Central Park Zoo. I think we may consider her as a Lady in Aviation.

* * *

Following Miss Amy Johnson's success, Miss Abe Misaki says that she will fly from Tokyo to London. More power to her.

* * *

Two women air tourists have just returned from Europe with their machines. Mrs. Virginia Stork is one. She used Paris as her headquarters, and travelled all over Europe by what she calls the most delightful method. The other is Miss Margery Durant. She toured Europe and North Africa on behalf of the National Aeronautic Association.

* * *

The annual air race between Liverpool and Manchester was held on August 15. Miss Winifred Brown came in first on her Hermes-Avian. She was closely followed by Mr. Hall. As she did not pass the finishing line between the white crosses she unfortunately had to be disqualified.

* * *

Miss Emilie Samon, film stunt actress and aviatrix, was unfortunately killed when her parachute failed to open at Copenhagen, Denmark.

* * *

The Women's Duration Record in Gliding is now held by Mrs. Russell Holderman. It is 46 minutes.

* * *

There are now 471 women pilots in the United States, of whom 58 are of the Limited Commercial variety, 37 are Transport pilots and the remainder are private pilots. Five women are mechanics and there are three women glider pilots.

Warplanes

(*Continued from page* 24)

haps be faired into the fuselage, firing through the propeller in the usual manner. It seems that air-wheels are here to stay, and their use on the future fighting plane would eliminate the necessity for shock absorbers, further reducing the weight. They would also make it practical to operate from rough fields. Of course the entire structure would be fully streamlined in order to secure the utmost efficiency.

Imagine the demoralizing effect on the enemy troops of a surprise attack by these tiny machines descending upon them like a swarm of angry hornets. It would be quite a thrill to fly one of them in actual warfare, but you have noticed that I've said nothing of accommodations for a pilot. As a matter of fact, there would be none!

Why not eliminate the danger of flying them low over the enemy territory? To equip them with radio control would only be a matter of experimenting. Even recently a radio controlled airplane was tested successfully in Texas. It has been persistently rumored that the government authorities of several nations, including the United States, are making tests of various types of radio-controlled aircraft. The time of the Robot plane may not be as far off as one might suppose.

Furthermore, the small planes would not necessarily have to be directed from an observing plane or dirigible. A television transmitting set in the plane could send images to a controlling station, where they would be thrown upon a large screen in front of an operator. The effect would be

(*Continued on page* 48)

Sopwith Camel

(*Continued from page* 44)

a hole out of a thin piece of Balsa, sufficiently large to receive the motor stick. Simply allow it to rest in place at the rear. Another method of holding the stick in place at the rear would be to make a large clip that will reach from each side of the fuselage. This is a clip arrangement wherein the motor stick can be pushed into this part of the center of the fuselage.

Thrust Bearing and Shaft—No. 12

Thrust bearings are always a sort of a problem. It seems that the right kind and size are seldom at hand. The simplest and best way to make one is to use a small nail, flattening out the full length slightly, but at the point that will be drilled it is flattened more than the remaining part.

The shaft used for the propeller is made of piano wire .029 inch diameter. Bend to the shape as illustrated in the side view of the drawing and allow a length of approximately 1½ inch from the end of the propeller to the hook. If the propeller shaft is made short and stubby, the propeller tends to wabble and is not as efficient as with a longer shaft.

Decorating and Emblems—No. 14

The allied war circles are used with the red, white and blue tail stripes in an upright position. Most of the Spads used by the American division had khaki colored bodies and natural colored wings.

Flying—No. 15

Because of the possibilities of damage to a scale model it is advisable to employ dihedral. Inherent stability is desired of all models because they do not have the ability to correct their path of flight.

The approximate center of gravity must be located and the necessary weight added to the nose to bring about the meeting point of the center of gravity and the center of pressure. After this is secured, it may be advisable to glide the model minus the motor stick, afterwards adding the motor stick, gliding it again and making adjustments for flight.

When the model is ready to be tried, it is well to have a boy friend help adjust to the proper balance, one boy launching it and the other boy catching it, first being very close together and gradually widening the distance until the model glides normally.

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1/16 x 1	.04	8 for	.35
1/16 x 3/16	.02	6 for	.10
1/16 x 1/8	.05	8 for	.35
1/8 x 1/8	.01	6 for	.05
1/8 x 1/4	.02	6 for	.10
1/8 x 3/8	.02	6 for	.10
1/8 x 1/4	.02	6 for	.10
1/8 x 1	.06	6 for	.33
1/4 x 1/4	.03	6 for	.15
1/4 x 1	.07	3 for	.20
1/2 x 1/2	.07	3 for	.20
1 x 1	.18	3 for	.50

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36-inch Lengths

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1/16 x 3	.10
1/8 x 2	.06
1/8 x 3	.10
1/4 x 2	.07
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1/2 x 3	.19

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1/8 x 3/4 x 7 1/2	.02		
1/2 x 1/2 x 6	.02		
1/2 x 3/4 x 5	.01 1/2		
1/2 x 1 x 8	.2 for	.05	
3/4 x 1	1/2 x 10	.04	
1/2 x 1 1/2 x 11	.06		
1 x 1	1/2 x 12	.08	

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XUM

Transport Job

(*Continued from page* 24)

The amusing part of the whole thing, however, is the drawing which is a part of the article. But far more amusing is the set of "explanations" given telling how the contraption is supposed to operate. For those young birdlings who wish to learn how flying was supposed to be done in the year 1709, these instructions are given below:

A—Represents the Sails wherewith the Air is to be divided, which turn as they are directed.

B—The Stern to govern the Ship, that She may not run at random.

C—The Body of the Ship which is formed at both ends Scollopwise; in the concavity of Each is a pair of Bellows, which must be blown when there is no Wind.

D—The Wings which keep the Ship upright.

E—The Globes of Heaven and Earth containing in them Attractive Virtues. They are of Metal, and serve for a Cover to two Lodestones, placed in them upon the Pedestals, to draw the Ship after them, the Body of which is of Thin Iron Plates, covered with Straw Mats, for convenience of 10 or 11 men besides the Artist.

F—A cover made of Iron Wire in form of a Net, on which are Fastened a good number of Large Amber Beads, which by a Secret Operation will help to keep the Ship Aloft. And by the Sun's heat the aforesaid Mats that line the Ship will be drawn towards the Amber Beads.

G—The Artist who by the help of the Celestial Globe, a Sea Map, and Compass, takes the Height of the Sun, thereby to find out the spot of Land over which they are on the Globe of the Earth.

H—The Compass to direct them in their Way.

I—The Pulleys and Ropes that serve to hoist or Furl the Sails.

Very unfortunately, no record seems to have been kept of the fledgling flight of the "Flying Ship," but it doesn't take too much strain on the imagination to figure the outcome should it have attempted to take off. Probably all of us would rather take a chance on a fifteen-year-old Jenny than this wierd looking creation of the early 1700's.

We have a picture, however, of a very angry king and an inventor tearing his hair and gnawing his finger nails because his ship couldn't take to the ozone.

Bails Out

(*Continued from page* 18)

Technical School, leaning back against the rear outer bay strut. Technical Sergeant Douglas M. Swisher, 2nd Lieut., Air Reserve, flew the bomber up to four thousand feet over the airdrome. A camera-man in the rear cockpit snapped a picture showing me in the act of jumping clear of the broad aileron, and just starting to pull the ripcord.

"It took about eight hundred feet before I was ready to begin taking pictures of myself. By that time the training chute had already filled with air and the first camera had been brought into position for the first snap shot. There was plenty of time.

"Snaps were taken from arm's length from as many different angles as possible, with the idea of getting the face in each picture. Some of the pictures were good, in others the camera was not pointed just right and a few were badly fogged by the brilliant reflected light from the white silk of the chute above. As the ground came up to meet me, two shots were taken with the camera pointed down to show how the approaching earth looked.

"Letting the two cameras hang by their lanyards, I had both hands free to manage the chute for the landing. Neither camera was injured in the least in the final tumble. The surprising thing about these pictures was that all of them showed exactly the same expression—an easy confidence in the outcome."

Warplanes

(*Continued from page* 46)

exactly as if one were riding in the plane from which the images were sent. Of course, television has not yet reached this stage of perfection, but there is every indication that it will within a few years.

All controls, as well as the guns, would be supervised by radio. The plane could be maneuvered at will, and after its mission was finished it could be directed back to the point of departure. If it was shot down no life would be lost. By the use of infrared rays the plane could "see" in the dark, making it extremely valuable for observation purposes. A large bomber equipped with this apparatus, together with engine silencers, would be a terrible weapon of war indeed.

As to the disadvantages of radio control, it would be impractical to install a separate apparatus and screen for each plane in a squadron. And this would be necessary if the planes are to operate independently of each other, for unless each machine was tuned to a different wave-length, the directing impulses would interfere with each other, probably causing collisions.

To explain further, suppose each plane was tuned to the same wavelength. Then it is obvious that every one would execute the same maneuver simultaneously. If one of them is slightly upset by a gust, when it is brought back to equilibrium by the operator the same impulse will automatically deflect the other planes from their path. A similar complication would arise from the television equipment if each apparatus was of the same wavelength. The result on the receiving screens would be a hopeless jumble of images.

Then, apparently the only feasible method of controlling several planes at a time would be to limit the size of a squadron to a few ships, providing each with its own controlling apparatus and television screen. The equipment of each plane would be tuned to a slightly different wave-length. It would be desirable to use beam trans-

(*Continued on page* 62)

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½x1, ½x¾, ½x¾	.04
½x1, ¾x1, ½x1¼	.04½
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The Vacuplane

(*Continued from page 32*)

up and moved to Miami to construct a ship without any wings—with nothing but a cellule lift—and show the world that there was something to this new principle after all.

On his arrival in Florida, he went to the University of Miami and told Ensign Fred H. Given, then in charge of the aviation department, of his hopes and his accomplishments. He asked Ensign Given to utilize the members of the aviation class and the laboratories for constructing a plane with a cellule lift, one that could fit inside an ordinary garage and have a cruising speed of more than 100 miles an hour. One that would take off in around fifty feet and land with a forward speed of 20 miles an hour. Out of this the X1-3 or Vacuplane was born.

In picking Ensign Given to help him construct such a plane, Mr. Lanier was dealing with a man who had built his first Bleriot ship at his father's farm back in 1910. He was a member of the Royal Flying Corps and the U. S. Navy, and was civilian inspector with the Navy Schneider cup team when it traveled over to England to bring the speed trophy to America.

The Vacuplane does not have wings in the ordinary sense. It has a cellule spread of eight feet nine inches, and a chord of eleven feet two inches. This gives it only 84 feet of lifting surface because of the tapering effect of the cellule. Yet this 84 square feet of lifting surface was sufficient to lift 1,051 pounds gross weight at a takeoff speed of 55 miles an hour when powered with a five cylinder 85 horsepower Le Blond engine.

When this curious looking craft was completed, it was taken out to the All-American airport for a test. Because of the design, and the necessity of working out many details during the construction, there was some doubt if the cellule was sufficiently large to lift the weight. The features which have made the XL-2 an inherently safe ship had been retained but the weight had been reduced and other refinements incorporated.

When Ensign Given crawled into the little cabin, a mechanic spun the propeller and the little craft rushed down the runway. In 75 feet it had attained a speed of 50 miles an hour and the wheels left the ground. Around the field it went, Ensign Given holding it about ten feet off the ground.

Then he rolled down—stopping in 33 feet. Sixteen times he repeated the performance. He found all controls functioned perfectly, but with the lateral control a little too sensitive. But that was a small detail. The cellule had demonstrated its ability to take the ship off the ground. At 50 miles an hour, in an 18-mile wind, the lift per square foot was 11⅞ pounds!

Ensign Given, in explaining the details of the ship, stressed the fact that the construction of the experimental plane was carried to a radical point in order to prove the theory of the lifting power of the cell.

In his report to the inventor he said: "All control surfaces functioned perfectly and if anything a little too sensitive on the lateral controls. The balance was perfect. The lateral control on the longitudinal axis causes a slight uncomfortable oscillation, but this can be overcome by bringing this control up into line with the cellule and ailerons. This will dampen the controls a bit, and allow a pendulum effect rather than swinging laterally on a longitudinal axis."

Today the ship is back in the laboratories with nothing to show that it ever left the ground but the motion picture record. To dampen out the lateral control, the cellule is being widened about two feet and the ailerons are brought up to the outside edge instead of against the fuselage as shown in the picture. A slight change is also underway in the cellule itself, the last three buffers being covered over—a change which Ensign Given expects to give a greater lifting power.

Discs are also being attached at both ends of the cellule to prevent tip loss and, with these refinements, the Vacuplane will be taken aloft to be put through all the stunts which Ensign Given can make it do.

While this little ship shows a remarkable advance since the XL-2 was built and flown in 1930, it is this new type of lift which is the keynote which may bring decided changes in aviation within a short time.

This has been accomplished by producing a new lifting force with a high lift cellule, narrow span, deep chord and open top to evacuate the top cell. The cellule is located well forward over the engine and extends back half way or more over the fuselage. The cellule produces a pendulum effect in the fuselage and performs the function of a parachute in the descent.

The photograph of the XL-2 shows wings in combination with the lift as there was some doubt that the device had the lifting ability claimed for it. Wings can be applied to any plane with a cellule lift, but their purpose is simply one of carrying an extra payload and does not affect the function of the cellule in any way. However, as the theory is based on the lift, it was decided to build a wingless plane. Mr. Given has refined the XL-2 and the theory has been proved in its first flight.

With the refinements now carried out on the Vacuplane, Ensign Given expects the ship to take off in fifty feet at 40 miles an hour, and to land with a forward speed of less than 20 miles an hour inside of 30 feet. The ship will have a cruising speed of 135 miles an hour and is being re-equipped with a 30 gallon gasoline tank which will give it a cruising radius of 800 miles.

However, several months will pass before the Vacuplane is taken out again for flight, for when it takes to the air then Ensign Given wants to call it a finished job. When this stamp is placed upon it Mr. Lanier will take the ship on a tour of the country to be exhibited at air races and expositions.

The specifications of the Vacuplane as it was successfully flown are:

Wing section—Durand No. 13—with slight modifications; gross weight at time of flights, 931 lbs.; span of cell, 8 ft. 9½ ins.; chord, 11 ft. 2 ins.; area of cell, 84 sq. ft.; aspect ratio, 9/11 to 1 (less than one to one); lift per sq. ft. at 50 m.p.h. in 18 m. wind, 11 7/84 lbs.; dihedral and cabin loss not figured.

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XUM

Airy Chat

(*Continued from page 6*)

let's see what he looks like? There are several girls at Mills Field, where I am flying, who would like to get a glimpse of this "dynamite" person.

In view of the above, and my instructor's threat, I'll just sign my name as Bessie D.

And so, Captain! You've got them to looking you up. That name "dynamite" is sure going to stick around this office—it is so appropriate-like.

* * *

WHILE we have been gabbing about Captain Purcell's past performances we almost forgot to mention the skipper's story in this issue, endeavoring to prove that flying is not as dangerous as the newspapers would have us believe. Purcell backs up his claims by listing a whole lot of old-timers who are still hanging to the stick, and, as a matter of identification, he sent us about ten times as many photographs of the air veterans as we could print. This, we hope, will give a new slant on aviation, removing the crepe that has been hanging on the hangar for the last ten years.

* * *

TURNING over the proof of the new cover calls to our attention the little line at the bottom of the picture. This is to the effect that our copies printed this month will be 73,070 instead of the 53,000 printed last time, an increase of about 40 per cent.

* * *

STILL talking about the cover, you will see a picture of the "Vacuplane," one of the most interesting developments that we have run across in a long time. And this little ship is not simply a freak, either, for it really flies and performs in a creditable manner, as you will find in the story describing the "Vacuplane." We were rather skeptical about this ship, we had seen so many unsuccessful radical ideas in the past, but on close examination it proved to be a very logical application of accepted principles. We defy our cover critics to laugh this stunt off.

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EDW. B. BELL, *Managing Director*

WE have had a lot of favorable comment on the first part of the Glider Instruction series started last issue. In this issue we are presenting the second part of the glider story, where we get right down to brass tacks and take up gliding practice in earnest. This series has not only been of interest to beginners, but we have had complimentary letters from old hands in the gliding game as well.

* * *

THEN, again, we have been working out a brand new idea in this issue which we hope many of you fellows will look over. This scheme is for the benefit of our real fliers and mechanics —a series of articles dealing with the many practical problems that come up in a day's flying. Other flying magazines, as well as ourselves, have rather neglected the real fellows in the game—and now we are going to make up for past neglect by running good practical helps and kinks for the owner and pilot.

First of all, just take a look at the article on the inspection and maintenance of light planes. Stuff of this sort seldom appears in print and it is a mystery why it has been overlooked so long. I'll bet that there are 2,000 lightplaners, both licensed and bootleggers, who'll eat this stuff right up. We would like to have your ideas as to the betterment of this work and put it up to you to call for what you want. You're the boss, so kick in with comments—or good articles on the subject.

* * *

AND now a letter from an English reader catches our eye. It seems good to think that your broadcasts reach so far. Mr. E. M. Gill, for that is our English reader's name, writes as follows:

I bought my first copy of POPULAR AVIATION*—the September issue—today, and I am so impressed with it that I am writing immediately for a year's subscription.*

I am a member of the Herts & Essex Aeroplane Club, Broxbourne, Essex, and hope to take my license shortly. I have done one hour solo so far.

* * *

EVERY once in a while, the old "Q. & A.," better known as the "Question and Answer Department," gets an awful lot of punishment. Our staff gets stopped cold on some of the posers that are submitted, and just as an example of what makes "Q. & A." editors leave home and seek the wilds of the far west, we will just look this one over from R. W. W., Aberdeen, Wash.

I read about the gun that shelled Paris during the war. They had to have it fire east of the mark because the earth moved during the flight of the shell.

Why can't the fliers of the Pacific Ocean go against the earth's rotation instead of with it, as they have been doing? How high does a plane have to go to be able to stand still and let the earth go by?

THERE have been a whole lot of letters, lately, requesting dope on aviation engines. Their lament in general points to the fact that the engine is responsible for the whole flight—so why not more engine and less plane in these stories? Just to show that our middle and last names are "service," we have selected the very fine article by K. Hughes, formerly chief field mechanic of a large airplane manufacturing company. His subject, most entertaining and instructive, deals with the trials and tribulations experienced in testing engines and planes.

This covers the subject from an entirely new angle, and as little has been printed along these lines, we believe that there is room for a lot more of this sort of information. What about it?

* * *

A PERFECT shower of letters followed the publication of the $225 German flivver plane picture. This was not a long nor prominent article, but it filled the office full of letters. It is our belief that the price tag, rather than the ship itself, is the underlying cause of all the excitement.

After a lot of searching around, we have been able to uncover only a few facts about this ship. It was designed by F. Koch of Berlin, and is to be put into production by a German labor organization—presumably as soon as they succeed in raising the required number of marks for carrying on the work. This is about all that we could dig up.

Now, why get all heated up over this flivver? If you should buy one, even at $225, it would cost a whole lot to land it in this country after the shippers and custom house were paid off. A good American lightplane would be cheaper and more satisfactory in every way, and if you did own such a ship, where in the name of Mike would you get replacements or spare parts?

* * *

EUGEN BRANSTETER of Arcanum, Ohio, writes an aviation letter like a veteran, although he is only fifteen years old.

Although I am only fifteen years old, I can say that I know quite a bit about aviation. I saw Bert Scheel at Dayton National Air Races, or whatever his name is, fly the wings off his ship, land himself in the swamp, and make men sweat digging him out.

Bert had a ship too fast for its strength, but, Bert, I am sorry to say, it was your own fault. Was on hand when the De-Shazo accident happened at Chicago, and was at the races and air shows at Cleveland and everywhere else.

My father and myself take in all the races. Dad designed a ship a long time ago which he never built. Last summer some of my friends were around here with a OX powered JN4-JN4A-JN4D-Jenny-Canuck or box-kite, whichever you want to call it, and a Stand-

(*Continued on page 54*)

Lightplanes

(*Continued from page* 26)

It should then be pressed back into place, and clamped until dry.

Small blocks should be placed on each side of the prop so the clamp does not bite in. These blocks should be of balsa, if obtainable—if not—of very soft pine. After the glue has set (about a day), the clamps should be removed and the prop sanded down fine.

If a little heavy on the repaired side, a coat of varnish on the reverse side of the other blade is sure to restore balance. The prop may be tracked by placing some object, such as a box or saw-horse, on the ground in back of the low blade in such manner that it just touches some part of the prop. The prop is then turned so the other blade is in the same position, and if this blade touches the box at the same point, the prop is in track. If not, it may be brought into track by tightening the hub bolts.

Thin paper may be used as shims if tightening the bolts is insufficient. No loose gravel or small stones should be beneath the prop while the ship is warming up for they are picked up and damage the prop considerably by causing cracks and splinters.

2. CARE OF THE FABRIC OR COVERING—If the fabric shows signs of any tears, chafes, or rips, it should be repaired in the following manner: For tears or chafes—First smooth out the fabric around the tear, then prepare a patch of fabric sufficiently large enough to cover it with an inch surplus all around after the edges have been frayed about one-quarter of an inch. Then coat the surrounding fabric with dope and lay the patch on smoothly. See that all the frayed edges are pulled out evenly and are doped down well. Sand after the first coat of dope has dried, and then apply three or four more coats of dope, sanding after each coat. Lacquer of the same color as the surrounding surface is used as a finish. The same procedure is followed in the case of a rip or hole, a rip however, should be sewed up with linen thread before patching.

3. CARE OF THE WOODWORK—The wing woodwork should be inspected frequently through the inspection patches, and if any cracks or other damage are seen, the covering should be removed around the broken member and the broken member replaced. If a spar is cracked, the entire covering will have to be removed and the spar replaced.

In removing the spar, the ribs should be damaged as little as possible, and care taken that the new spar is exactly the same as the old one. As this is a major repair job, it is best done by a licensed man if you are not competent. It should also be remembered that if more than fifty per cent of the job has to be repaired, stress analysis is required in case of a federally licensed ship.

In all, a woodwork job, if a large one, is best done by a competent man, unless you yourself have built the ship, or are experienced in woodworking. The same procedure is followed in case of a broken fairing strip or wooden tail surface that need repairing.

4. CARE OF THE FITTINGS—Cracked or broken fittings should be replaced immediately. In making replacement fittings, see that the new ones are of the same shape and gauge and are well painted before replacing. Any damaged bolts or nuts must be replaced immediately. All scratched hard wire braces should be replaced before they are given a chance to break. In case of suspicious looking strut or wire fittings, the best bet is to put new ones in their place.

5. CARE OF METALWORK—In case of broken or bent longerons or struts, the broken or bent members should be replaced with new material. Steel fuselage repairs generally require the services of a welder. A good man should be chosen when a job of this sort is to be done, so the resulting job will pass federal inspection—if need be.

All bent metalwork should be replaced unless the bend is very slight, or the member is in a position where it receives little stress. In replacing metal parts, be sure the new ones are the same size and shape as the old, and are an exact fit.

If the information contained in this article is followed, the owner of a light ship, cannot but help get the best of service from it. He should remember, however, that the ship is safe only as long as he keeps it so, for by being careless, the inevitable result is an accident, when it is least expected, and few recover from the types of accidents caused by rank carelessness. Accidents only help to stifle the public interest in aviation.

Trouble Shooting

(*Continued from page* 18)

ally, one will start when the switch shows "off" and stop when the switch shows "on." I've known them to start and not stop at all. One outstanding case I will relate shortly in a minute. Crossed wires, loose connections and defective switches all have to be guarded against. A safe policy to adopt is to assume all engines are on contact until you know different.

A CLASSIC example of conversion to this form of thinking in wholesale lots occurred in the motor department of a factory and is a matter of lifelong record in the minds of those who were present. It was precipitated by nothing more than an inert engine hanging on a chain fall!

An unsuspecting mechanic strolling along, gave the propeller a flip, much in the same manner as you or I would flip a stray branch of an overhanging tree. He barely escaped with his life as the engine roared forth and slashed out like a demon with its bare two-bladed prop of steel, crashing and banging around on the scaffold which supported it by a chain.

It lasted only a few seconds, but they were seconds that put a chill in more than one man's spine. You won't find any of those boys going around, pulling strange props and wondering if the blame thing is loaded.

This engine had been removed bodily from a plane; motor mount, propeller and all. The magnetos were on contact because the switch and ground wires had been disconnected, the carburetor was partly full of gas and the throttle was hanging open.

Just a dead, lifeless engine hanging on a chain fall; ready to kill or maim the man who playfully approached it without warning.

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Airy Chat

(*Continued from page 52*)

ard, which was powered with a Hisso 150 H.P.

I got in some time with them. Maybe you know Fred Decore? Well, he is the fellow who has the Hisso-Standard. Lincoln Beachy taught him to fly. I don't know but I think it was in your magazine that you recalled some of the old days, and Fred's name was mentioned.

If you know him, I'll try and get Fred's address and you can write to him. He's in the South now.

He's getting old and doesn't talk about himself much—a great flyer, though. I'm sending some pictures taken at races, and of my father beside the Jenny. My dad is fat, but I'm not, so don't take me for a fat kluck.

AND they have pulled off the classic Schneider Cup race for the last time! Once again Old Man Speed got smacked in the eye—and a good smack it was. One lap run off at 404 miles per hour with an average of 379.1 miles per hour. That's sure moving some. If there are any further improvements they will seriously endanger J. B. Rathbun's contention that 500 M.P.H. is the absolute and ultimate in flight speeds. "Oh, well," says Rathbun, non-committal like, "they'll have to add 96 M.P.H. to the bill, and that's no easy ticket considering that they nearly had to double the power to jump a measly 38 M.P.H. in the present contest."

This year they certainly tore loose and did big things in a big way. Spectators claimed that the piers and wharves rocked with the roar of the exhaust, and it must have been some roar coming from twelve cylinders measuring 6x6.5 inches. If you wish any more of the details, find them elsewhere in this issue.

* * *

MODEL builders, literally by the hundred, have been storming our gate for over a year, demanding information on wartime insignia. It took a long time for us to get the dope together, for information on this subject is as scarce as bee's teeth, but we finally got the dope and are printing it in this issue.

* * *

TALKING about the war, we have another announcement to make that will make the photo collectors stand up and take notice. By very good fortune, we managed to lay our hands on a lot of photos showing wartime ships not often seen. This good luck we will pass on to our readers via the next issue. The illustrations for the next issue will consist largely of the Caproni ships, including the huge triplane, in which you are sure to be interested. And we promise another thing—often demanded by our readers. We will print the pictures in such a location that they will not interfere with pictures on the opposite side of the page.

* * *

HERE'S a man who advocates the use of two-cycle engines wholeheartedly, and this department is with him—in general. It is not the first time that two-cycle aviation engines have been proposed—not by a jugfull, for there were the old Roberts two-stroke, the Fox of lamented memory, the Elbridge and a number of others whose names escape us at the present time. They failed, not because the basic principle was wrong, but for the reason that the designers were not financially strong enough to bear the burden of development. Now let us hear what Al Thomas has to say on the subject.

I have often wondered why some engine manufacturer has not put a suitable 2-cycle engine on the market. If properly built, it would be far superior to the 4-cycle.

I have studied several attempts made along this line and noted the mistakes in each case. The most frequent mistake is the attempt at air-cooling, failure being due to the fact that there seems to be no metal or fins that will carry away the heat quickly enough. The 2-cycle hits twice where the 4-cycle hits once; therefore it is necessary to use a jacketed cylinder and a solution for cooling.

Another error is the old conventional crankcase compression, which requires mixing the lubricating oil in the gas. When the gas is diluted with oil it does not fire as readily as a pure mixture, thereby causing misfiring and loss of power in the charges that do fire.

Engineers agree that a 2-cycle engine is only about 65 to 70 per cent efficient per power stroke compared with the 4-cycle. Aside from the aforementioned shortcomings, another deficiency is found in the crankcase compression itself. When the piston goes up, and the gas rushes in through the carburetor and check valve to fill up the vacuum created in the crankcase, the pressure reaches about 11 to 12 pounds. Then, when the piston descends compressing mixture in crankcase, opens the by-pass and gas is forced up to cylinder head, the pressure therein is approximately 10 pounds. Some designers have attempted to use a blower to force the gas into cylinders, but without success, as a pressure of about one pound is all that a blower will deliver. The crankcase system at its best delivers about 5 pounds.

* * *

THE Round Robinites are going along, interfered with by vacations and other summer transactions, but still going along. Maybe, when the cold weather chases them out of the old fishing hole, or off the park benches, we will get more action from the members.

* * *

WE have two readers who are faced with the engine problem. Fred Quick, 305 N. Clayton Street, Bloomington, Ill., needs a 25 H.P. engine, for which he is willing to pay $30. And then, Donald Andrew, Newhall, Iowa, wishes to buy a converted Henderson motor. Button, button, who's got the engine?

* * *

WE have heard often enough of pilots who have tried to avoid fogs, but here is one who tried it out of curiosity. He must have been successful else we would not have the pleasure of receiving his letter. Paul Herman, of Woodside, L. I., New York, tells us of the fog experiment:

"I am an aviator and air mechanic with considerable experience in both branches of aviation. I always longed for a chance to fly in a fog, until finally the chance arrived and I took advantage of it. I got into it and found it easier to get out than I had figured, but just the same it took all the experience and nerve that I had.

"Finally, I found my way out, but I just got out in time, for a big trimotor was coming straight nose-on toward me. I passed it when only 400 feet away—and that was plenty close enough. I have learned to fly without trouble—it is easy to fly if you only put your mind to it."

* * *

WE have more good news for you that will be welcomed by the war fans. Lieut. A. B. Jarrett, who conducts a war relic museum on Steel Pier, Atlantic City, is going to Europe shortly. He intends to pick up more relics and data for his museum. Incidentally, we have commissioned Lieut. Jarrett to assemble more wartime air data for us, and as a result POPULAR AVIATION will have a goodly stock of war story material on hand at all times. We believe in true war stories, rather than fiction, as you have noticed in the stories that you have read. And we have a good collection of wartime aerial machine gun photos on tap for you.

* * *

SHERMAN WENGUD of Millersbay, Ohio, together with a few other model makers, thinks that our model section is too small. This is what he has to say:

(*Continued on page 56*)

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Blind Flying

(*Continued from page* 30)

error as soon as the horizon or earth presents its familiar face. If he doesn't, the instructor takes charge and rights the ship.

You can very easily see why these "horse sense" pilots crash. There is no such thing as an instructor to correct them and blizzards bear no reputation for clearing suddenly so aviators can get their bearings.

So Mr. Student goes back to earth, somewhat chagrined, but a bit wiser—or at least his instructors hope so. After another siege of instrument training, he goes up again and the same procedure is repeated. On this second trial, perhaps 50 per cent of the neophytes will still gyrate into that same old spin, but the other 50 per cent show first signs of a dawning light and begin to believe what their instruments say.

The third time is a matter of make or break for the student. If he insists on ignoring his instruments and again swishes into the spin, he's through so far as a college or the army is concerned, or in aviation parlance is "washed out."

Stubbornness, inability to comprehend the infallibility of his instrument board, lack of faith in it and an overwhelming desire to perform as his instincts dictate, makes him useless as a flier—much less a transport pilot.

Practical Lessons

(*Continued from page* 38)

pit like a man, and see if I can break her loose any quicker that way."

Back they climbed to the 7,500 foot mark, leveled off and then sent her into another spin. Around went her tail and down went her nose as before, and soon she was all wrapped up in the spin just as tight as before—if not tighter and faster.

"Stand up," ordered Ed, at the same time standing himself. "I'll darn soon find out what is making her behave this way, or else I'll let her bury her nose so deep in the ground that they'll not salvage anything but the license number. Now watch me, kid—watch the stick and rudder."

To the great surprise of both of them, she started to slack off on her rotation as soon as the stick reached neutral, and observing this, Ed decided to let it stand in neutral for a second or so. And then, she walked right out of the spin just as nicely and neatly as the first ship had done—all by herself with the controls in neutral.

"Ha, I thought so," said Ed. "Those smart guys on the ground with all their diagrams and graphs didn't crack this nut. One ounce of experiment is worth a ton of slide rules and aerodynamic hooey. As the guy said, 'I can't speak algebra,' but I can tinker around until I find out what's wet whether the books say it's so or not.

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Airy Chat

(*Continued from page* 54)

"I like your magazine, but I wish that you would put in more about endurance models, such as the fuselage models and the twin pushers. Would also like to see more scale drawings. I am building a scale model of the Gee Bee sportster from plans in your magazine."

* * *

WELL, Sherman, we can't very well put in much more model stuff without disturbing the balance of the book. You see, there are only a limited number of people interested in models, and as one magazine is for all of you, we can't devote much more than our present space unless we enlarge the whole book.

* * *

WE have another letter from over the water—from Scotland this time. Mr. A. Millar has sent us an interesting lot of clippings relating to old-time ships. Most of the clippings are from "Flight," the English aeronautical paper. The clippings include such old-timers as the Savary, Nieuport monoplane, Goupy biplane, Pischoff, Breguet, the Cedric Lee and others. Thank you, Mr. Millar, these clippings carry us back a good many days and nights to the old times.

* * *

AND, say, you modelists, we have a surprise for you. Joe Ott is going to give you the plans for the Schneider cup champion in the next issue, so that you will be first with the latest. Just how he is going to work out the pontoons we can't say as yet, but this will be one best bet in the way of models.

* * *

NOW we are at the end of our story. The stopping off point, or, if you prefer, the jumping off point. We have greatly enjoyed going over this month's correspondence and trust you will contribute as freely next time.

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Safety of Airplanes

(*Continued from page* 20)

in this way, the drawings are made and the machine is constructed.

To guard against possible flaws in the material, overloading within limits, or errors, the materials are made several times stronger than indicated by the stress analysis. In other words we make a safety allowance known as the "safety factor" by which the calculated stress is multiplied before the size of the material is computed.

Thus, if the estimated stress on a certain part is 1,000 pounds, then the stress is multiplied by a given safety factor which may vary from two to 20 depending upon conditions. If the allowable safety factor is 5.00 for example in our problem, then the resistance of the part is calculated at: $5 \times 1{,}000 = 5{,}000$ pounds. The method of calculating the stresses and the allowable safety factors for each part are controlled by the U. S. Chamber of Commerce. The safety factor is also sometimes known as the "coefficient of ignorance" for it takes care of unknown conditions.

Where the load is steady and does not reverse, the safety factor is low. Where the load varies rapidly, where impact is likely or where the part is subject to much vibration, then a very high safety factor is used. All of these matters are carefully threshed out before the drawings receive their final O.K. and are sent to the shop.

In spite of careful inspection, some weakness is likely to develop in the material or in the manufacturing process so that the only safe method of guarding against trouble is to actually test the assembly according to some standard method. The preliminary calculations are not infallible, no matter how carefully they may be carried out in the engineering department, and while the predictions come very near the truth in the majority of cases, yet there is always a chance that they will fail.

Testing an assembled wing, an assembled fuselage or a completely assembled airplane by loading it with sand bags is as old as aeronautic history, but if carried out systematically and carefully it quickly reveals defects and errors that would otherwise remain undiscovered until the ship was put into service.

The wings are tested by supporting them at the proper points and then loading them with sand bags along their length in direct proportion to the air pressures actually coming on them. Then in a reverse sense, they are subsequently loaded so that the landing stresses are represented. It is always considered in these tests that a combination of stresses may take place, and that the weight of the sand bags must be equal to the combined loads.

In Fig. 1 we have a sand bag test being made on a steel monoplane fuselage, this being a test for the flying loads. By means of a chain hoist, the fuselage is suspended from the ceiling at the point where the wings will be attached, while the floor of the cabin is loaded with sand bags to represent the weight of the passengers.

Near the top, and directly in front, is a large bag that represents the weight of the engine and fuel tanks, and it is evident that the safety factor is being taken into account as the weight of the bags appears far greater than the weight actually coming on the machine in flight. At the rear is the weight equivalent to the loads produced by the tail surfaces. After loading, all parts are carefully examined for fracture or deflection so that the integrity or weakness of the structural parts is known at once.

In Fig. 2 the stresses are reversed to determine the strength of the ship when making a landing, and to exactly simulate conditions in actual practice you will note that the fuselage is inclined at an angle corresponding to a very rough contact. The chain hoist is released so that the load comes on the landing gear, and once more the parts are examined to see whether the reversal of the stress has indicated structural weakness.

After the completion of the fuselage and wing tests a test of the machine completely assembled may be considered necessary before the plane is made ready for its flying tests. Conducted in this way, at least one uncertainty is removed before the test pilot rolls her out on the field.

Lincoln Beachy

(*Continued from page* 16)

ounce of his flying ability into the act. His plane skimmed above the water scarce an hundred feet. With a sudden burst of speed he was cutting through the mists above the falls.

It was easy, once he was in the chasm, to go under the bridge. But the difficulty came when he tried to pull out. The ship refused to respond.

He remembered the tradition of the Niagara Indians that, "Thundering Waters" demanded yearly at least four victims to satisfy its mysterious power. Seldom a year passes but what this is carried out. Beachey wondered if he was to be one of the victims! For a few seconds, which under the circumstances seemed a lifetime, it looked that way. At that moment he was nearer death than he had ever before been in his adventurous career—and that's saying a lot!

Once out of the chasm he made for the airfield. Calmly he greeted those who gathered about him. And, as is so common with flyers who perform deeds of great bravery, Beachey withdrew himself as into a shell, and would have nothing to say.

Since Beachey's trip under the bridge there have been others who have made the same flight, but just stop for a moment and consider the type of ships used by flyers in those early days, and those in use today. Those "Early Birds" were certainly not lacking in daring, skill or ability.

XUM

Hawks' Speed

(*Continued from page* 20)

the pilot of a fast ship need seldom hesitate about making a detour to avoid a storm, whereas in a slow machine he has to consider whether he can afford the extra gasoline required to make a detour.

Much has been done to perfect the ground organization on which aviation so greatly depends, but there is still a good deal of room for improvement in weather forecasts and their transmission by radio also in the various instruments which the pilot uses in bad weather and in the "sign posting" of air-mail routes.

In my opinion, immunity from forced landings depends so much on the efficiency of the ground organization of an airline, that no advantage is to be gained from the use of multi-engined aircraft. Ships of this type are slow and unwieldy compared with single-engined planes, and they are just as likely to be brought down by bad weather. The fact that they can still fly if an engine fails means very little when engine trouble is such a rarity.

DURING the two years in which I have been making high-speed long-distance flights, I have learned enough to make me confident that the fast transport ship is a practical proposition. I am planning a machine which will do about 200 miles an hour at top speed, and cruise at 175 m. p. h., carrying a payload of a ton. My own airplane, which is a sports-model, can carry a payload of 500 pounds, though for record-breaking purposes I have filled all the available space with gasoline tanks so as to increase its range.

At present, the average airplane engine is of about 500 horsepower. I think we want motors of from 700 to 1,000 horsepower, designed so that they can be streamlined into a clean fuselage. There is a good deal of talk nowadays of the "machine of the future," which is usually visualized as one that will fly seven miles high with passengers enclosed in an air-tight cabin.

I think people are putting the cart before the horse by talking so much about hermetically-sealed cabins, the probable effect upon the passengers of flying so high—and so forth. Surely the first thing to do is to set about designing a ship that will reach that height in a reasonable time!

Except for machines especially designed for attacking the height record, there are none in use today that can get anywhere near seven miles high. We have a great deal to learn about propeller and engine efficiency and it will take some years of experimenting before flying at these heights becomes a practical proposition.

If transport ships are to operate at heights of 40,000 to 50,000 feet—and I see no reason why not ultimately—it is essential that they should have a fast rate of climb. Obviously, there is no purpose in spending three or four hours in climbing to some immense height when, by flying at a normal level, you can get to your destination in the same time. High-flying machines will have to be considerably faster than those now in general use, for the speedier the plane, the better its rate of climb.

I FIND that many people are under the impression that there is a good deal of difference between cross-country flying in America and in Europe. Personally, I think that the problems of air-navigation are much the same all over the world. In certain States of America, the airman has an advantage which is probably unique. Years ago, the Government surveyors laid out each farm in the form of a perfect square of 640 acres in area, the length of each boundary therefore being one mile.

Working with compasses, and all the usual paraphernalia, they fixed the boundaries so that they ran dead north and south, and east and west. Thus, all that the pilot flying over such States has to do is to take his course from these section lines. He need not bother to look at his compass at all. But, for the most part, the United States is the same as any other country to fly over.

I do not think that the public is yet quite ready for the high-speed plane. It is only natural that most people should look with more confidence on a large multi-engined ship than on a comparatively small slender plane with only one motor. But speed is the only thing the airplane has to "sell," and I am certain that with efficient salesmanship it will not be long before the public begins to demand much faster air mail and passenger services than are at present available.

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Flying Not Dangerous

(*Continued from page* 14)

for a set-down and duck hot water that boiled from the radiator.

These old-time "gypsies" had to have everything in the world in the way of flying sense. Motors then were a long way from what they are now. Oh yeah! And how! Once again we have to use a big round goose egg for a figure to cover the cost of his wrecks. (Oh mister news editor, ain't we got fun.)

Next on our list is a little guy. He's just about knee-high to a grass-hopper. His name is Ralph Virden, known to his friends as Pee-wee. This boy started flying in 1918, but his air hours sound like the national debt. The author will give a rough guess and say he has averaged five hours a day in the air since he started. Here's another drink of castor oil for the above mentioned editors.

This boy has nine-tenths of his flying time in air mail planes, and to add another little extra dose, he has received several prizes for his carefulness in flying. It is a matter of fact that the books of the company for whom he flies show that he has never damaged any plane of the company in eight years of mail flying. (The author hears someone "whistling in the dark," and it sounds like a news editor.)

Then we have another "little big guy." His name is Jess Hart. Many of you eastern pilots know him, and any of you who were down at North Island during the war, you can't help but know him. He has flown mail all over the country, in fact most of his flying time has been spent in mail jobs. He's hopping Stinsons now for the Century Airlines out of San Francisco. After reading his log, the author found that two bucks would cover the total damage to his ships caused by smash-ups.

Now for another "mail man."

Capt. Clare Vance is his name, and he's another half-pint when it comes to size. He's been hopping from Oakland to Salt Lake City so long that he knows every farmer on the way. This is another bird that started flying away back in the dark ages, in fact he's been flying so long that they call him "grandpa" around the hangar.

Someone told the author that old Grandpa Vance helps some of the farmers on his run by chasing the milk cows home for them. It isn't much trouble to dive down on a pasture and shoo the cows up to the house. Once he made a mistake and "shoo'd" the wrong cow home, but that's another story. Smash-ups? I'm sorry, Mr. Newshound, but that's something he ain't got none of.

Now we have another old-timer—John Sharpnack.

Jack went into the army sometime back in the dark ages, and flew everything there was to fly, including a lot of things that were only supposed to fly on paper. When the war was over, he took to the mail racket. This was when they flew old DH's.

Mail pilots had a certain amount of say-so in those hectic days, as to whether they would fly or not if the weather was bad, but it is a matter of record that Jack never turned down a run. Weather to this bird is just one of those things that you have to get along with. This man's whole flying life just goes to prove what we can do in the flying game when we use our heads for something besides a hat rack.

His flying country is the Rocky Mountains, noted for some of the world's worst storms, but did this boy fly through them? He did! Did this boy ever smash up? HE DID NOT! One smash-up on most of his route would be one smash-up too many.

I almost forgot to mention another oldtimer—the grand daddy of them all. Arthur R. Wild, commonly called "Pop," started flying with a gang of Pilots who were very well known in their day, namely, Lincoln Beachey, Arch Hoxey, Charles Niles, Joe Boquel—and last but not least—Art Smith.

Pop is one of the big answers to our newspaper friends, as well as the answer to the question at the head of this article. Pop is lame today, due to an automobile accident (the irony of fate), but he is still connected with the flying game—very much so.

Then we have another oldtimer getting grey around the ears in the flying game—none other than old Doc Whitney. Flying since 1910, Doc has the habit so bad now that he hardly takes time off to eat. He now flies a "parlor, bedroom and bath"—a Fokker F-32—for the Western Air Express.

He was flying long before Col. Lindbergh knew what an airplane was. When someone wishes to date something, or place the happening of an event in the flying game back in dark ages, they usually start by saying "When Doc Whitney flew to so-an-so."

Another old timer in the flying game is one well known to army men—Col. Thurman H. Bane. Col. Bane is one of the real old timers of army flying. In fact, he and a few others were the whole Aviation Section of the Signal Corps at one time. When flying picked up, and a few congressmen learned to see over and beyond their noses, Col. Bane was made assistant to General Mitchell. In this capacity, he appeared before Congress during the War and told them just what this country should have in the way of airplanes and men.

When he finished, they gave the Aviation Section some forty-eight million dollars more than he had asked for. Does he know flying? This birdman has forgotten more flying than the average pilot will ever know. About two bits would cover the damage caused by one of his fatal smashups. As President of the American Airways, Inc., his position in the flying game is established.

Why go on? The author could fill this Magazine with several hundred others. General Mitchell, Maj. Burwell, Capt. McReady, Capt. Doolittle, Chas. Pond, Maj. Livingston Irving, Bob Fowler, Roy Francis, Ray Little, Jimmie Rutledge, Fred Kelly, Ray Crawford, etc., etc., and so on. It is not due to lack of material that we are forced to quit, but to lack of space.

If this article will give relief to those silent sufferers of the flying game, the mothers and dads, then these old timers will feel that their lives have not been spent in the flying game for nothing. If your boy or girl are taking up flying as a profession, they are assured of a good income and a long and happy life in spite of newspaper editors, ginks and what have you.

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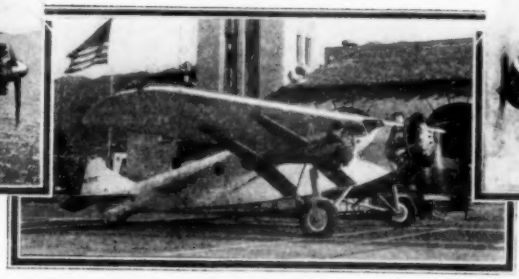

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IN SUNNY SAN DIEGO, CALIFORNIA

95th Squadron

(*Continued from page* 10)

As the Chateau-Thierry offensive progressed, the 95th Squadron took part in the tremendous struggle of trying to hold a superior German Air Force in check. The battles cost them dearly but gave them confidence for the American drives that were to follow.

For the sake of continuity I have purposely delayed telling about most of Sumner Sewall's exploits. His experiences were many and fascinating. Prior to his squadron's move to Chateau-Thierry, Sewall and two other pilots attacked six Germans over Menil-la-Tour. Having the advantage of altitude, the Americans gave a good account of themselves until Sewall's companions both had the hard luck of getting their guns jammed.

They withdrew from the fight, and Sewall, though realizing how hopelessly outnumbered he was, fought his adversaries for fifteen minutes. They forced him into numerous perilous positions and made him use all his skill to evade them. Finally, he sent one of the enemy down in flames and the combat was terminated.

ONE of his greatest combats took place in July back of the German lines. The air was full of Huns that day, and his patrol attacked five Fokkers. After a little maneuvering he separated one Fokker and got on its tail. Disregarding the fact that his foe fled further and further into Germany, Sewall dived to within fifty feet of the fleeing German and sprayed him with bullets until he saw the Fokker crash into the trees. Sewall was so near the ground himself that he was caught in a hail of rifle and machine gun fire, several bullets passing through his clothing.

Sewall and his companions moved in September to Erize-la-Petite, near Verdun, and prepared for the two American offensives to follow. An experience of Sewall's on this front is one of the most remarkable of the war.

A formation of the 95th Squadron was cruising along at 15,000 feet over the enemy lines on September 14. Sewall, the rear man of the flight, heard a familiar and fearsome noise behind him. A lone Fokker had dived on him, and the Hun's fire was ripping the Spad to shreds.

Sewall whirled about to give battle to his courageous German who was foolhardy enough to attack one of six Spads. As he swung out of the Fokker's line of fire, he made the appalling discovery that the incendiary bullets of the enemy had set his gasoline tank on fire. The foe of every airman—fire! Few escaped it, as Sewall knew. His awful plight was enough to drive a man insane.

His flight comrades had not noticed his predicament, so the unmolested Fokker sat on his tail and poured a stream of bullets into the descending Spad.

Was this sportsmanship? No, it was war—the kind practiced by both sides, though there was little personal bitterness. A few weeks before, Sewall had sat on the tail of a German and poured a hail of lead into him until he crashed into the trees.

IN a dive of fourteen thousand feet, the German stuck as close to Sewall as he could get, his streaking bullets buzzed and darted through the wings and body, the tracers flashed by Sewall's head. All this time the American was skidding his plane a bit to avoid these messengers of death.

Just above the ground, Sewall had two surprises: first, the German considered him done for and gave up pursuit; secondly, he found that his own precipitate flight and maneuvers had fanned out the flames. Tottering across No Man's Land, Sewall brought his flame-ravished Spad to the ground in the maze of shell holes behind our own troops.

His landing completely finished the badly battered plane, and he crawled out of the debris quickly enough to hear the last part of his machine hit the earth. It was a wheel. Strange as it may seem, the German's stream of bullets had cut a wheel completely off the Spad, and the wheel had floated down, hitting the ground after Sewall landed.

Sewall's guardian angels continued to ride in the cockpit with him until the cessation of hostilities. On October 13 he went to the rescue of an American observation plane menaced by nine Fokkers. With the utmost intrepidity he dived in and destroyed the German who had the advantage of a strategic position. Sewall was then attacked by the other eight planes and succeeded in outmaneuvering them and drawing their attention away from the observation machine, which was thus enabled to escape.

Let me take you back a few months to review the early accomplishments of Waldo Heinrichs, one of the original quota of pilots who went with the 95th Squadron. His experiences are among the most remarkable I ever heard. At some time, for instance, in his air career, it is reported that he turned a double somersault on the ground in his machine, which was blown into a ditch as he was making a landing. He escaped without a scratch.

Another minor incident. He was flying along at 1,500 feet one day, and a fragment of an anti-aircraft shell tore the propellor cmopletely off his plane. Though the splinters whirled past his head, none touched him and he landed unhurt.

THE German pilots in the Toul sector were not venturesome, but one day Heinrichs did encounter a fellow who was anxious to give battle. There was a little preliminary maneuvering and Heinrichs got the advantage in position, enabling him to dive on his antagonist.

As he swept near the hostile plane, his machine gun rattling perfectly, he overshot the mark and ran the German down in the air. The wing of his plane struck the tail of the enemy machine and, the last time he saw it, the German was falling, apparently shot down.

But Heinrichs was in a perilous state: the collision had ripped half the fabric from a wing of his plane. He found himself falling and could do nothing about it. His plane, in a nose dive, would not respond to the controls because he did not have fabric enough on the wings to keep the machine in a normal line of flight.

He dropped over five thousand feet before he solved the difficulty and got his craft on an even keel. Just then the archies started hammering at him, and they kept it up until he sailed over our lines in the gathering gloom and managed to land in an upright position.

Some weeks later, Heinrichs and another member of the 95th Squadron encountered six of the Circus. A bitter dog fight lasting fifteen minutes followed. As they went into action, Heinrichs found himself battling against two enemy machines and for a while, through inspired maneuvering, he was able to evade their fire. Twisting and turning about, he got a faint glimpse of the other Germans who were not over a hundred yards away. He could see frequent bursts coming from their guns as they fired at his companion.

Heinrichs was doing splendidly with his two opponents until he made one bad turn and was carried a little out of position. As he came at them next time, he was forced to relinquish his position of superior altitude and dived. At the same time he made a fast turn and came back at one of them with the idea of shooting the German down from underneath.

He would probably have succeeded in his attempt, had there not been outside interference. One of the Germans who had kept out of the combat up to this point, seeing his comrades hard pressed, dived on Heinrich's tail and rushed at him with both his Spandaus spraying lead. Heinrichs' fast turn threw him into the furious hail of bullets.

Heinrichs was wounded in ten places: a bullet struck him in the left heel, another grazed his right ankle. An explosive entered his left thigh and another his left elbow, the last one smashing his elbow and fracturing his arm both above and below. Two explosive bullets went completely through his right hand, and a third struck him in the face. This bullet in the face exploded in his mouth, broke both jaws, knocked out fifteen teeth and ripped out the right side of his face.

(*Continued on page* 62)

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95th Squadron

(*Continued from page* 60)

IN spite of his dreadful injuries, Heinrichs had presence of mind enough to put his plane in a straight nose dive. After a drop of three thousand feet, he straightened out and skimmed under some telegraph wires, landing within the German lines. Here, though one arm was useless and his other hand shot through in two places, he unstrapped himself, climbed out and almost succeeded in burning his plane before a flock of Germans ran up and made him prisoner.

While the primary purpose of the pursuit squadrons was to clear the air of enemy planes, they often took special missions of a hazardous character, calling for trips deep into enemy territory. Their machines were so much faster than observation types that they stood a better chance of returning from a flight forty or fifty kilometers back of the German lines.

On the second day of the Meuse-Argonne drive, the army called on the 95th Squadron to despatch a plane to the region about Stenay—then far behind the enemy lines—for the purpose of observing German troop movements. It was not an easy mission, and Ted Curtis volunteered to take it.

HE flew along the Meuse through heavy anti-aircraft fire. Later, when he descended to a point where movements on the ground were plainly visible, the machine guns pelted him. The information Curtis brought home was extremely valuable to the army, and the flight won him the Distinguished Service Cross.

About a week later Walter Avery, who had shot down the great German ace Menckoff, at Chateau-Thierry in July, joined members of the 94th Squadron in making a daylight raid on an enemy balloon.

Every detail of the attack was carefully worked out. Tom Crocker and Ham Coolidge, both members of the 94th Squadron, were given the task of burning the sausage. The rest of the flight were instructed to engage any hostile planes that might try to prevent Crocker or Coolidge from reaching the target.

Unfortunately, Crocker and Coolidge in their eagerness to burn the balloon did not wait for the protection patrol. A flock of Fokkers flew in to intercept them, but just as the Germans swooped down to the attack, a single Spad dived on them from the clouds. This caused the enemy to give up their designs on the balloon strafers in order to protect themselves. The Germans shot down the single Spad after a furious battle, but in the meantime Coolidge had burned the balloon and the big formation of Spads had fallen on the Fokkers.

Other Fokkers, hanging in the clouds, dropped into the conflict, and a great dog fight that disrupted all formations raged across the sky. Climbing, diving and twisting endlessly, the Spads and Fokkers came to grips in a giant struggle, with the result that six machines crashed to the earth and others were almost disabled. Two of the luckless pilots were Americans, the other four Germans. Avery of the 95th, who went down in one Spad, was wounded and made prisoner.

WHILE this big air battle was in progress, Ted Curtis found an L. V. G. two-seater and attacked it. He had maneuvered into a vulnerable position and seemed on the point of shooting the twisting L. V. G. down when his guns jammed and forced him to pull away. It was at this opportune moment that Ham Coolidge and Rickenbacker of the 94th Squadron, returning from the balloon raid, saw the predicament Curtis was in and dived to finish what he had started. Thev sent the L. V. G. down in flames.

Jim Knowles of Cambridge, Massachusetts, and Cincinnati, Ohio, was one of the 95th Squadron's most successful pilots. In a combat at Chateau-Thierry in July he surprised an enemy two-seater, protected by six pursuit planes, destroying it and evading the other six by skillful maneuvering.

During the bitter fighting in the Argonne our pursuit planes did a great deal of flying at low levels to protect our balloons and, insofar as possible, prevent German machines from strafing troops back of our lines. On one of these missions, Knowles saw three Fokkers diving to burn an American balloon. He rushed in and courageously engaged them in a struggle lasting five minutes. He sent one of the enemy down in flames; the others streaked for home.

The 95th Squadron had a balloon artist, "Denny" Holden, who was second only to Luke in the number brought down. Of Holden's seven official victories, five were balloons.

Near the close of the war Holden had an extraordinary experience on one balloon raid. He drove off a hostile plane near the German balloon line and whirled down to attack the first sausage in a line of five that were a kilometer apart. To his surprise the end one was a decoy: it was fully rigged but had no observer in the basket. He meant to burn it anyway, but his guns jammed.

Pulling up, Denny fixed his guns and dived through the tremendous hail of bullets and shells that surrounded number two. He got so close that the observer jumped, but again he had the disgusting experience of finding his guns jammed after the first short burst.

It took tremendous courage to dive through the deadly fire about a sausage even once. Holden, with all the discouragement brought on by guns that continued to jam, persisted until he had ridden through the withering circle of lead and steel four times and had burned one sausage.

Schneider Cup

(*Continued from page* 23)

cooling surfaces, for it must be remembered that a tremendous amount of heat is created by the powerful engine. It is calculated that about 40,000 heat units must be radiated per minute, which is approximately equal to 1,000 horsepower. Another point of interest is the fact that the centrifugal force is so great at the turns when making over 300 miles per hour, that the gasoline will not flow at this time from the main tanks.

Considerable interest is, of course, attached to the engine that performs this prodigious labor. It is a 12-cylinder Rolls-Royce, Model "R," specially developed for this purpose. It develops 1,900 brake horsepower and weighs 1,530 pounds stripped. It is approximately eight feet long and thirty inches wide. As might be imagined, the gasoline-mileage is low, about one gallon of gas to each 2.25 miles.

In respect to the seaplane complete, it will be said that it has a span of thirty feet, a wing area of 145 feet and a total empty weight of 4,030 pounds. Fully loaded for the contest with pilot, gasoline and oil, the gross weight is 5,230 pounds, or slightly over two tons.

Complete plans for a scale model of the winning ship will be prepared by Joseph Ott, our model editor, in the next issue of Popular Aviation.

Warplanes

(*Continued from page* 48)

mission in directing the planes. This would avoid interference with other attacks in progress at the same time, provided some of the planes were tuned to the same wave-length as those in another squadron.

It is quite reasonable that a combination radio and television apparatus could be developed which weighed no more than a human pilot. Of course, such a delicate mechanism might be easily put out of order by gunfire. But, if built into a compact unit and perhaps sheathed in armor, should be no more vulnerable than a man. The planes might be loaded with a high explosive so that if one were disabled the shock of the resulting crash would destroy it, preventing the secret of its construction from falling into the hands of the enemy.

Possibly the only objection to this plan would be the danger to our own troops if the planes crashed behind our lines.

There would be no risk in landing the planes returning from an attack. The landing field could be situated some distance from the control station. The control stations, incidentally, should of course be bombproof and concealed under ground, for they would be the natural objectives of all the enemy bombers.

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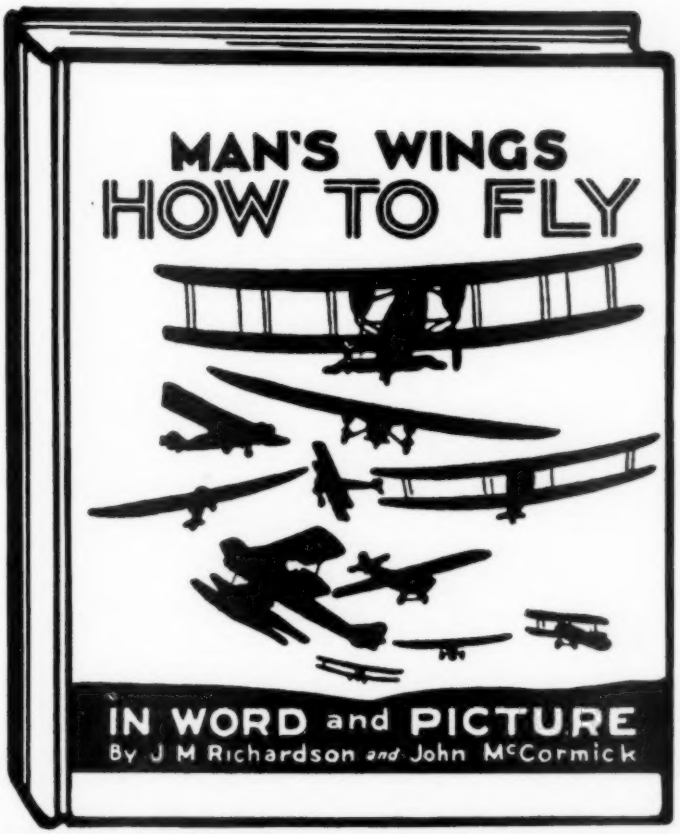

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Many Laughs

(*Continued from page* 19)

sense of humor. This same instructor showed him how over and over again, but Abe couldn't seem to get the hang of turns or tell how high he was when coming in to a landing.

One day Abe was very poor. The inspector brought him down after a particularly bad spiral. "Abe," he said, disgustedly. "I don't believe you're trying. Do you really want to learn to fly?"

"Sure I do." Abe replied anxiously. "I'm trying just as hard as I can."

"Well, damn it, do as I do, won't you? If I push the stick forward, you push it forward. If I push it right, you push it right. If I jump, you jump."

Abe nodded his head slowly. "I got you. I'll do everything you do."

The day of Abe's solo flight approached. He had improved a little but he was still ragged. The last thing the pilot said to him as the engine idled before they took off was, "I'm going to make you fly today you bet."

He took the plane up and headed for the wooded country. Abe was pushing when the pilot pushed and pulling when the pilot pulled. The pilot leaned over the left side and looked down at the green trees rushing by two thousand feet below them. Abe leaned over the left side and looked down, too.

The pilot bent over in his cockpit, then straightened up and held his stick up for Abe to see. Then he dropped it over the right side and looked around at Abe. Abe bent over in his cockpit and unscrewed his stick, held it for the pilot to see and dropped it over the right side.

The plane wobbled and went into a wide turn. The pilot screamed, "You idiot" at Abe and dove over the side. Abe pulled another stick from under his seat and screwed it in the socket. Gliding slowly down past the purple-faced pilot who was drifting slowly down to the green trees beneath his white parachute, Abe thumbed his nose, and flew gayly back to the landing field.

* * *

THE Commandant of the Naval Air Station at Pensacola was walking along the road just behind the seaplane beach one day when he heard the angry whine of a plane above him. Looking up quickly, he saw an N-9 seaplane spinning rapidly down through the clear summer air, apparently directly toward the very spot on which the Commandant was standing.

Not wishing to hamper the plane, he jumped quickly under the stone doorway of the building nearest him. There came a roar, a long whine and then a crash that was like the explosion of a Fourth of July cannon. The N-9 had landed—or rather crashed—in the sandy road almost at the Commandant's feet.

A large cloud of dust exploded into the air, hiding the plane from view. Being a kind-hearted man, the Commandant rather hated to look at the wreckage as the dust cloud cleared away. His surprise was unbounded.

A khaki-clad figure was standing looking at the wreck reflectively and brushing the dust from the seat of his pants. The Commandant walked out in the road and surveyed what was left of the plane. The wings had flattened on the road. There was very little left of the fuselage but kindling wood and torn fabric. The engine had nearly buried itself in the ground.

The Commandant turned to the student. "Young man, did you just come down in that plane?"

"Yes, sir."

"Are you hurt?"

"No, sir. Not at all."

"Young man, from now on I'd advise you to be very, very careful. Some day you're going to slip on a banana peel and break your neck."

* * *

TERRY had never been very good at Navigation, not even as a midshipman at the Naval Academy, and the more difficult aerial navigation at Pensacola was increasingly troublesome.

Finally the day of his navigation hop arrived. He was to fly along the coast for the first leg and establish his drift and wind speed. The second leg was directly out into the Gulf for half an hour. The third leg was to take him back to the Air Station—if he could find it.

The first leg went off beautifully. He used his drift indicator and it checked with time and distance perfectly. Quite unconcerned, he turned out into the Gulf, applied the wind to his course previously laid down, and settled back to wait for half an hour to pass. Unfortunately, he had applied the wind just backward.

At the end of a half hour, he turned confidently to the new course he had computed. If his figuring was correct, in forty-five minutes he should be over the Bay ready to land. At the end of forty-five minutes, however, no land was in sight. He was quite properly upset.

Turning a little more left, Terry flew on for fifteen minutes longer. Still there was no sign of land. By then, he was quite worried, for a hurried mental calculation convinced him that he had just enough gas to remain aloft one more hour.

Glancing down at the chart board, he happened to see the carrier pigeon always in planes for student navigation hops. By this means in case of a forced landing, the student could send a message to the Air Station.

With one hand, Terry opened the cage and took out the pigeon. Turning around in the cockpit, he reached as far aft as he could and released the blue and white bird.

With great anxiety he watched his feathered friend circle twice and then set off on a course a little to the right of Terry's. Fifteen minutes later, Terry landed his plane off the beach at the Air Station. Profound relief was his only feeling. Terry hadn't known the way home but the pigeon had.

* * *

HAL KELLER, student Naval Aviator, was up before the Big Board at Pensacola. The Flight Board had already recommended that he be dropped from the school and sent back to general service. They didn't seem to think that he would ever learn to fly.

As he sat in the Board Room with five aviators examining his case, Hal heard the facts one by one as they brought them out. He had taken an N-9 up for a flight. At two thousand feet, he had fallen into a flat spin. Was that correct?

"Yes, sir," Hal replied, firmly.

"What did you do to come out of the spin?" one of the officers asked.

"Everything that could be done, sir. I pushed the stick forward and hard right, and she just spun tighter and faster."

"Did you cut your gun?"

"No, sir."

"Then you spun in with your engine going full gun?"

"I guess I did, sir."

"You should have cut the gun, shouldn't you? It would have helped?"

"Yes, sir."

The President of the Board stood up at his end of the table and Hal stood facing him. "Have you any complaint to make about the treatment you have received or the instruction given you?"

"Yes, sir." Hal said very decidedly. "I think I got a raw deal from the Flight Board. I know I can fly. They should have given me more time."

There was a ripple of smiles around the table. Hal knew what they were thinking. He'd spun in with full gun, and yet he thought he ought to have another chance. Aviation was like that. It got into your blood.

Hal awaited the Board's final decision in the corridor outside the Board Room. The clerk came out presently, smirking, and said in his nastiest tone of voice, "Dropped!"

Airplane Insignia

(*Continued from page* 39)

lowed by the number that it was in the manufacturer's series of the type.

Thus we have the Fokker D. VII lettered on the plane—

FOK. D. VII/'17

The Germans nearly always used Roman numerals in designating a plane, while the number below the line is the date of manufacture.

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